

COTTON CLOTH DESIGNING

BY

JAMES HOLMES, M. Soc. Arts.

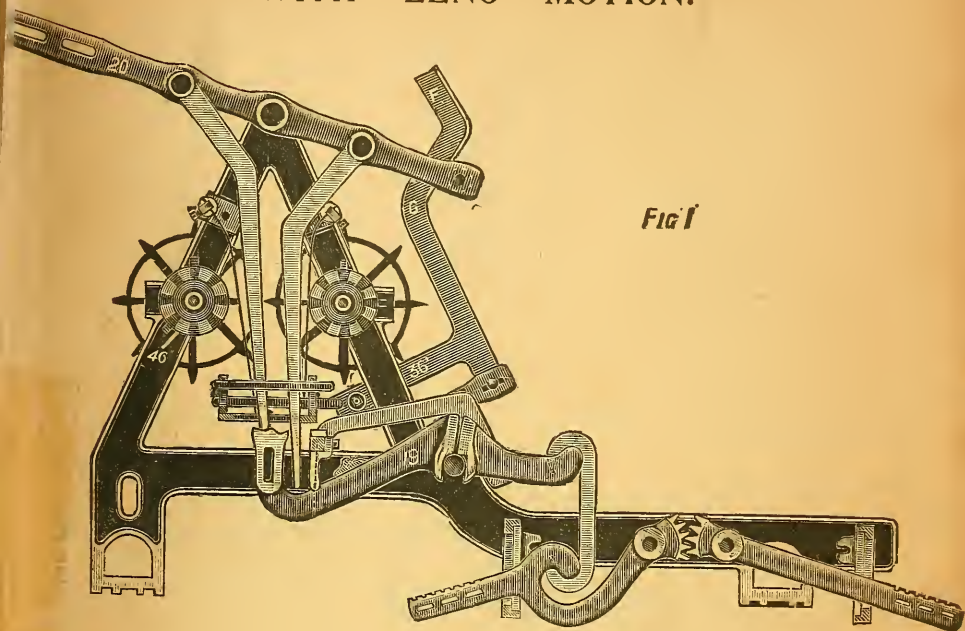
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Yours Faithfully
James Holmes

COTTON CLOTH DESIGNING,

BY

JAMES HOLMES, M. SOC. ARTS,

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To

CORNELIUS MORRELL FODEN, Esq., J.P.,

Honorary Secretary for more than a Quarter of a Century to the
BURNLEY SCIENCE, ART, AND TECHNICAL SCHOOL.


SIR,

Permit me to dedicate this work to you, as
one deeply interested in "Technical Education;" may
you long live in health to enjoy the pleasant recollections
of a life well spent is the wish of

Yours respectfully,

THE AUTHOR.

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PREFACE.

THE object of this work is to explain the Principles of Designing for simple woven patterns: no attempt has been made to deal with Jacquard designing, though a few of the patterns come under that head.

My thanks are due to my esteemed friend, MR. FREDRICK HEAP, Burnley, for producing many of the woven samples of cloth; the double cloth example has been kindly provided by the well-known firm of Messrs. BARLOW & JONES, Manchester and Bolton.

My thanks are also due to "THE STAR BLEACHING COMPANY," Horwich, for bleaching and finishing the samples of cloth.

*Burnley,
June 20th, 1896.*

J.H.



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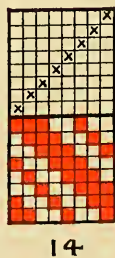
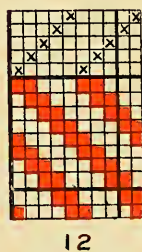
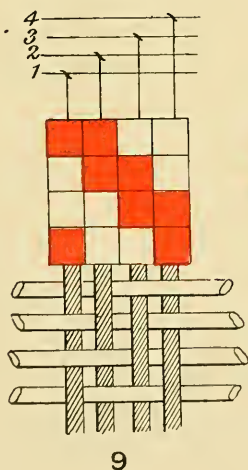
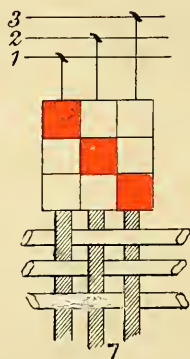
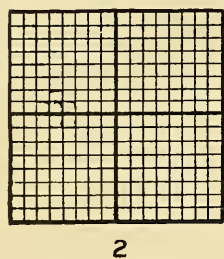
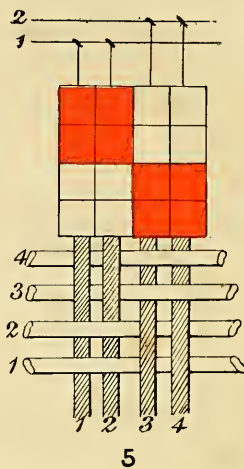
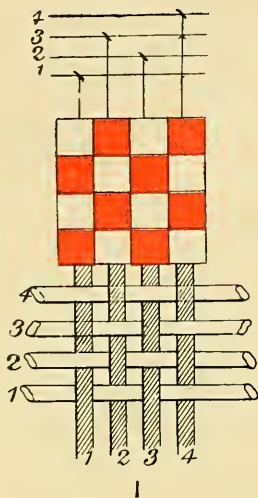
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PLAIN & TWILLS.—Plate 1.

 F a piece of plain cloth is examined through a magnifying glass it will appear as in the lower part of Fig 1, the vertical lines representing the warp ends, and the horizontal lines picks of weft ; it would take up a considerable length of time to illustrate the making of different figured cloths in this way, so that instead of drawing each pattern out, showing the interlacing of each warp and weft thread, design paper is used, which serves the purpose more effectually, a small piece of design paper is shown at Fig 2, it is paper ruled into small squares, and thicker lines divide the smaller squares into groups of 8 x 8. A row of squares across the paper represents a pick of weft, a row of squares down the paper represents a warp end. Whenever a warp end is lifted a small square is filled in ; referring to Fig 1, above the interlacing lines which represent the warp and weft threads is a piece of design paper much enlarged, the squares are filled in and left blank to suit the pattern below it ; taking the first end of the pattern, it is lifted on the first and third picks, above this end the first and third squares are filled in, the second end is lifted on the second and fourth picks, above this end the second and fourth squares are filled in, the third end is lifted the same as the first, therefore the third line of squares is filled in the same as the first, the fourth end is lifted like the second, and the fourth row of squares is filled in the same as the second ; the horizontal lines above the design paper shows the healds upon which the respective threads are drawn, the first end is drawn on the first heald, the second end on the third heald, the third on the second, and

the fourth end on the fourth heald; four healds are given here but two healds would be quite sufficient to weave this cloth, the first and second healds are tied together and work as one, the third and fourth are tied together and work as one, so that practically only two healds are used, the custom of using four healds instead of two, is to prevent the over-crowding of the stitches on the heald staves; Fig 1 is shown on ordinary size design paper at Fig 3, the looming is indicated by means of the crosses in the squares above the pattern, this is a more convenient method than using lines; Fig 4 is the same pattern using two healds only.

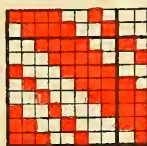
Fig 5 illustrates a basket weave; the lower part shows the interlacing of the warp and weft threads, the upper part the pattern on design paper along with the looming, the first and second ends are weaving alike these are drawn on the first heald, the third and fourth ends are alike, they are both drawn on the second heald, the pattern on design paper with looming is given at Fig 6.

Fig 7 illustrates a simple three-end twill, two ends down and one up on each pick; each thread can be followed and the manner in which the filled-in square is made to correspond with the lifting of the end; Fig 8 is the same pattern on design paper, with looming.

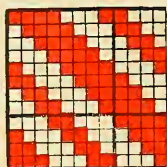
Fig 9 illustrates a four-end twill, two ends up and two ends down on each pick, the lower part gives an enlarged view of the warp and weft threads; with pattern on design paper and looming above. Fig 10 is the pattern with looming on design paper.

Fig 11 gives four repeats of a four-end twill. Fig 12 gives four repeats of a five-end twill. Fig 13, seven-end twill. Fig 14, eight-end twill.

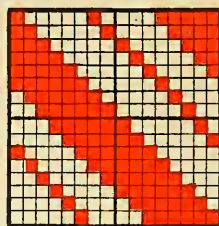
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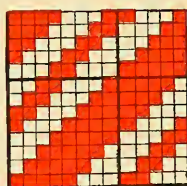
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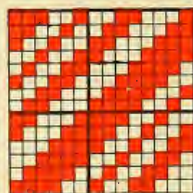
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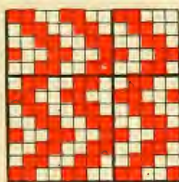
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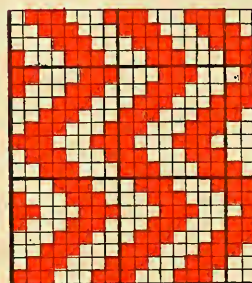
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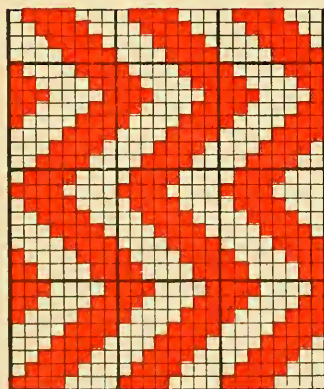
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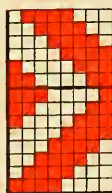
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24

TWILLS & WAVES DOWN THE PIECE.—Plate 2.

Twills can be made on any number of healds from three upwards ; in regular twills the same number of healds are lifted on each pick, the filled-in squares or rising threads advancing one to the right or one to the left on each pick, depending upon the direction the twill is running ; a number of ends lifted on each pick in regular order as shown at Fig 15 produces a diagonal line up the piece from right to left, there are ten ends in the pattern and as every end is weaving different to another ten separate healds are required to produce the pattern, two lines of twill will show in this case, one a broad one, made by four ends lifting together on each pick, the narrow line of twill made by the lifting of the single end ; the looming is straight through on ten healds, this twill if stated in words would be 4 up, 2 down, 1 up, and 3 down, the pegging or lifting plan is the pattern itself ; greater the number of healds used and greater the number of patterns that can be made, other twills on ten healds can be made thus, 5 up, 5 down ; 3 up, 2 down, 2 up, 3 down ; 4 up, 6 down, and so on.

Fig 16 is a 12-end twill showing two lines of twill.

Fig 17, another twill made on 16 healds.

In the cotton trade a large number of twills are made with the direction of the twill running up the piece from right to left. When twills are made on more than seven staves they are known as serges.

Fig 18 illustrates an 8-end twill, 4 up, 4 down, with the direction of the twill running up the piece from left to right, this example is reversible, as both back and face will be the same pattern.

Fig 19 is a twill made on 13 staves.

Fig 20, a twill showing three lines of twill, made on 14 staves ; a pattern broken up the same as this one, does not show up so well as Fig 17.

Waves down the piece can be made from any regular twill without increasing the number of staves, by making an alteration in the lifting plan or pegging.

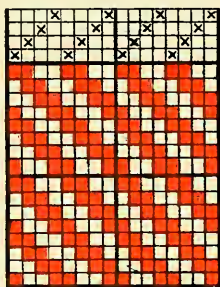
Fig 21 is a wave down the piece, the pattern is several times repeated ; one repeat of the pattern is shown at Fig 22, which is not only the pattern but the pegging plan as well, the foundation of the pattern is a 4-end twill, two up and two down ; after running the pattern for four picks, from left to right up the piece, the direction of the twill is reversed on the fourth pick, the twill running in the opposite direction, the fourth pick is not repeated as this would give two picks in one shed, so that all patterns made after this style will contain double the number of picks less two to what there are in the original twill from which they are made.

Fig 23 is another example several times repeated, made from the 6-end twill, 3 up, 3 down, one repeat of the pattern which is also the lifting plan is given at Fig 24.

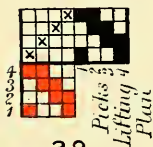
Fig 25 is made from the 8-end twill, 4 down, 4 up ; the pattern is several times repeated, to show more fully its appearance in the cloth. The complete pattern and pegging plan which stands on 8 ends and 14 picks is given in Fig 26.

Any twill given in previous examples can be treated in the same manner, and much variety of patterns obtained in this way.

Another method allowing plenty of scope for variety of pattern is to use say 14 or 16 staves, run narrow waves of twill down the piece, and fill in the intervening space with some small figure or broken twills.



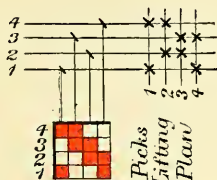
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Picks
Lifting
Plan

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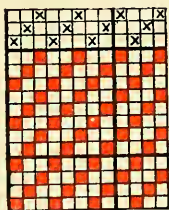
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Picks
Lifting
Plan



31

Lifting
Plan

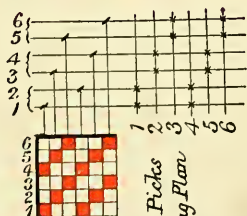


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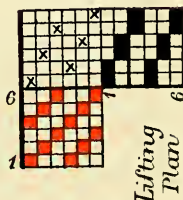
Lifting
Plan



35

Picks
Lifting
Plan

32



36

Lifting
Plan

SAMPLE CLOTHS, TWILLS—Plate 3.

Fig. 27 is a well known cloth, a 4-end twill 2 up 2 down on each pick, the line of twill running up the piece from right to left, the pattern on design paper several times repeated is shown at Fig. 28, the looming straight draft is shown above the pattern.

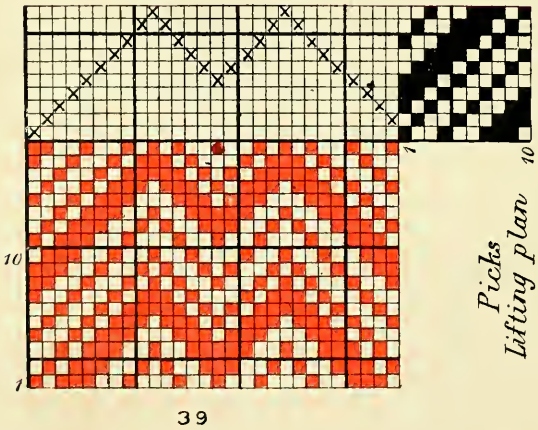
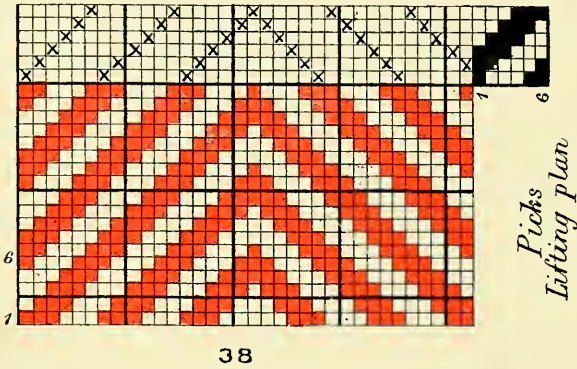
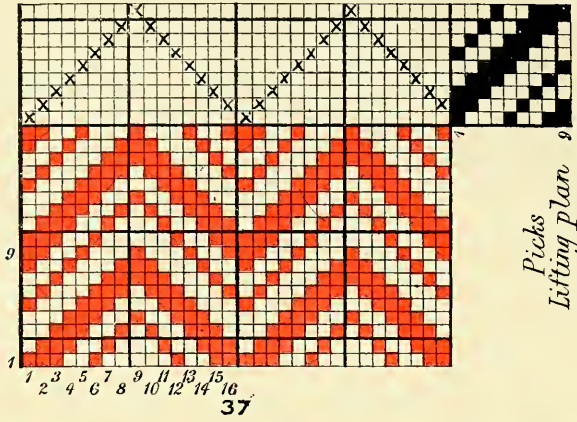
In Fig. 29 one repeat of the pattern is given in red ; above the pattern the crosses represent the looming, the black filled in squares represent the lifting plan ; obtained in this way, the first stave is lifted on the first and fourth picks, therefore the first and fourth squares are filled in black, the second stave is lifted on the third and fourth picks, therefore the third and fourth squares on the same line as the cross are filled in black, the third stave is lifted on picks two and three, and the fourth stave is up on the first and second picks ; this matter will be understood more fully by referring to Fig. 30, where the ends are shown drawn through the healds in the order 1, 3, 2 and 4, or in the same order as in plain cloth weaving ; this method is generally employed, as it enables the same set of healds to be used for weaving plain cloth at any time, by tying the 1st and 2nd staves together and allowing them to work as one, tying the 3rd and 4th together and allowing them also to work as one, a plain tappet being substituted for the twill tappet, in Fig. 30 the lines above the pattern indicate healds, the small dash indicates upon which heald each end is drawn ; for indicating the lifting plan, four lines are drawn at right angles to the lines which indicate the healds, these lines represent the four picks, and the lifting of any heald on any pick is indicated by a cross ; taking the first stave it is lifted on the 1st and

4th pick, crosses are placed to indicate this, the second stave is lifted on the 2nd and 3rd picks crosses indicate this, the third stave is lifted on the 3rd and 4th pick as shown by the crosses, the fourth stave is lifted on the 1st and 2nd pick, the crosses show this, so that the order of lifting is—

First pick,	1st and 4th	healds up.
Second „	2nd „ 4th	„ „
Third „	2nd „ 3rd	„ „
Fourth „	1st „ 3rd	„ „

Fig. 31 gives the same pattern showing design, looming, and lifting plan, on design paper. Fig. 32 is a 3-end twill cloth 2 down 1 up, the other side of the cloth is the right side, they are woven the wrong side up, so that one out of the three healds are lifted on each pick, if they are woven the other side up, the lifting is 2 up and 1 down on each pick; these cloths are known in the trade as “Jeans,” and are woven with tappets, generally to these, or somewhat similar, particulars 30in. wide 90 yds., 27 by 16 26s Twist, 32s Weft. The pattern several times repeated with looming is given at Fig. 33; if three staves are used to weave the cloth, the design, looming, and lifting is given at Fig. 34, the red squares indicating the design, the crosses the looming, and the black squares the lifting plan; in using three staves the stitches are very close together, so that it is customary to use six staves, tied together in pairs, the looming being 1, 3, 5, 2, 4 and 6, as shown at Fig. 35; or as shown on design paper at Fig. 36, red squares indicate the design, crosses looming, and black squares lifting plan, so that the order of lifting is—

First pick	1st and 2nd	healds up.
Second „	3rd „ 4th	„ „
Third „	5th „ 6th	„ „



WAVES ACROSS THE PIECE.—Plate 4.

In all the examples previously given the looming is straight through from front to back, and the number of ends in one complete pattern is equal to the number of staves used ; with making alterations in the looming the size of the pattern can be increased to almost any amount, without using any more staves for the purpose, waves across the piece are made from twills, in an endless variety of ways, by drawing the ends through the healds point draft, commencing on the front stave and going to the back, reversing on the back stave and coming to the front, and so on all the way across the warp. Fig 37 is an example made in this way, the pattern is repeated several times, the basis of the pattern is the nine-end twill, 3 up, 2 down, 1 up, 3 down, in the first nine ends of the pattern, no two ends are alike, therefore nine separate healds are required as indicated by the crosses ; but if any two ends in a pattern are weaving alike, they can be placed on the same stave ; in Fig 37 the 10th end is weaving the same as the 8th, it is therefore drawn on the 8th stave, the other ends which are alike in one repeat of the pattern are :—

The 11th and 7th drawn on the 7th stave

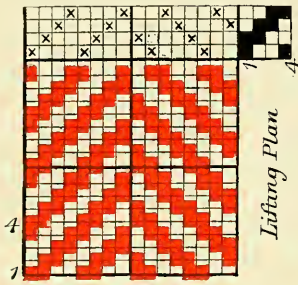
„ 12th	„ 6th	„	„ 6th	„
„ 13th	„ 5th	„	„ 5th	„
„ 14th	„ 4th	„	„ 4th	„
„ 15th	„ 3rd	„	„ 3rd	„
„ 16th	„ 2nd	„	„ 2nd	„

The complete pattern stands on 9 picks and 16 ends, the pegging plan is shown in black, number one being the first pick, the 1st, 2nd, 3rd, and 6th staves being lifted ; the second pick the 2nd, 3rd, 4th, and 7th staves are lifted.

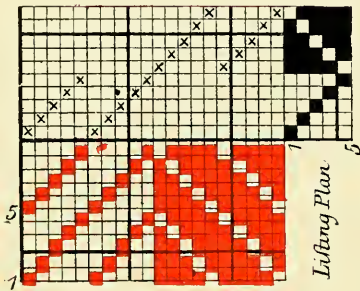
In Fig 37 the depth of the wave before the twill turns in the opposite direction is nine picks ; the depth of

the wave can be increased by altering the looming as shown at Fig 38, the ends are drawn in from front to back three times and then three times from back to front ; the basis of this pattern is the 6-end twill, 3 up, 3 down, and if the looming was point draft after the style of Fig 37, the depth of the wave would be 6 picks, but as it is, the depth of the wave before turning is 18 picks, and the complete pattern stands on 34 ends, the pegging plan is shown in black ; following out this idea, the number of times through in the looming before turning will determine the depth of the wave, multiplying the number of times through by the staves used, gives the number of picks in the depth of the wave, in Fig 37 where 9 staves are used if the looming is altered to 4 times through from front to back then four times through from back to front, the depth of the wave will be increased to 36 picks, and the number of ends one complete pattern will occupy will be 70, the pegging plan remaining the same in both cases. In Fig 39 the waves are not regular, one of them is deeper than the other, but still giving a pleasing effect, this is brought about by the looming only, which is somewhat irregular ; when any change takes place in the looming a corresponding change takes place in the pattern, the basis of the pattern is the 10-end twill, 1 up, 1 down, 3 up, 2 down, 1 up, 2 down, the first ten ends of the pattern are all different, and the ends are drawn through the healds from one to ten, the looming then comes from 10 to 5, the direction of the twill lines change for five picks, the looming is then from 5 to 10, the direction of the twill changes again for five picks, the looming is then from 10 to 2, and a like change takes place in the pattern, the complete pattern stands on 10 picks and 28 ends.

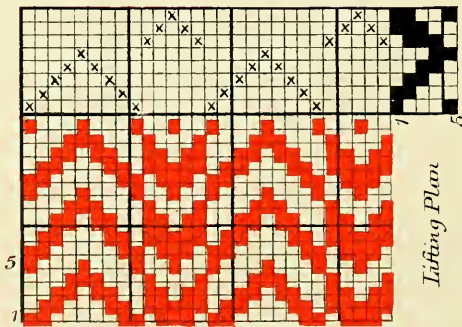




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43



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42

STRIPES, SAMPLES OF CLOTHS.—Plate 5.

Stripes are made in a great variety of styles, a fruitful source is shown at Fig 40, there are 16 ends in the pattern, which consists of two stripes of eight ends each, the design is given at Fig 41, in red, the crosses indicate the looming, which is somewhat irregular, but not a difficult one for either the loomer or weaver to follow, the black squares gives the lifting plan. The basis of the pattern is the four-end twill, 2 up, 2 down ; the width of the stripes can be increased to almost any extent without increasing the number of staves, or altering the lifting plan, the present looming is twice through from front to back, twice through from back to front (irregular), the width of each stripe standing on eight ends, if the looming is altered to six times through from front to back, six times through from back to front (irregular), the width of each stripe will be increased to twenty-four ends, and so on in like manner multiplying the number of staves used by the number of times through in the looming, to obtain the number of ends each stripe will occupy.

Fig 42 gives another sample of cloth, which gives a bolder effect than Fig 40. In one stripe there is a preponderance of warp, in the other stripe a preponderance of weft, one stripe showing the reverse of the other ; the design is shown at Fig 43, the crosses indicate the looming, and black the lifting plan, the basis of the pattern is the five-end twill, 4 down, 1 up on one stripe, 4 up and 1 down on the other ; the two stripes occupy twenty ends and five picks to the round in one complete pattern ; the width of the stripes can be increased in the same manner as in the previous

example, by an alteration in the looming, the lifting plan to remain the same.

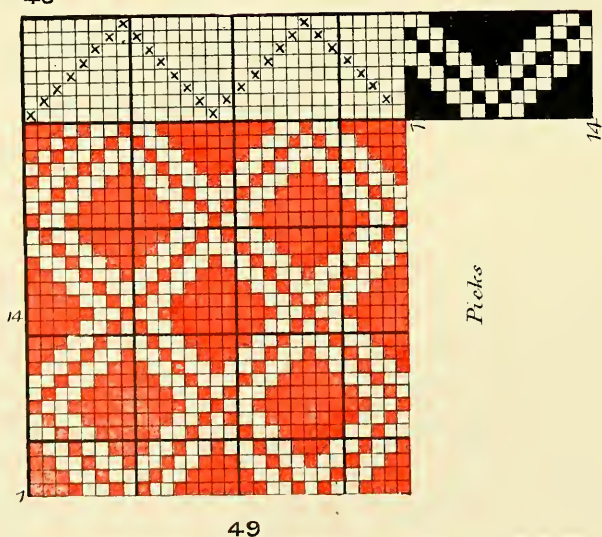
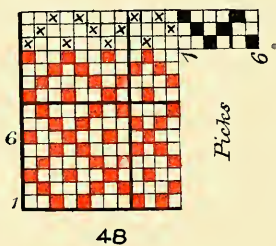
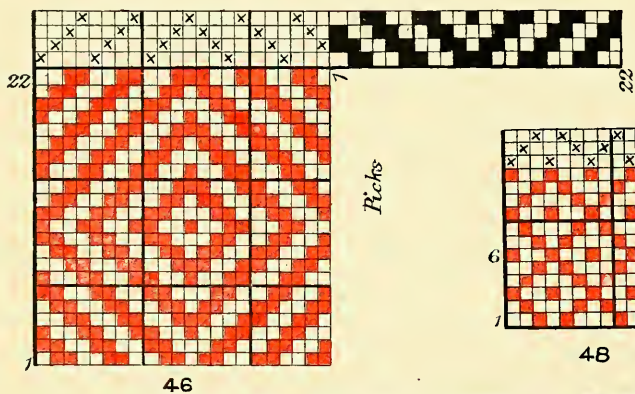
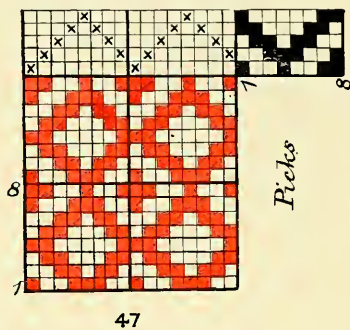
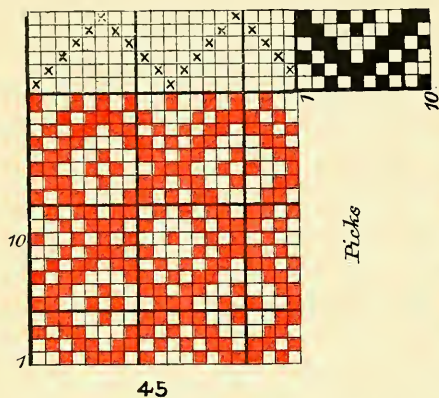
In the making of stripe cloths, with one warp, it is advisable to let each stripe be of such a weave, that the same amount of warp is taken up in both ; the cloths just given are good examples, or twills and satins may be made to go well together, or twills and spots made from the same twill, or waves across and down the piece, or satin stripes one to show warp and the other to show weft go well together ; in plain and satin stripes the plain weave takes up more warp yarn on account of the greater number of intersections, the tendency will be for the warp yarn forming the satin stripe to be more or less slack ; but still, nearly all sorts of combinations of weaves are used in the making of stripes, using two or more beams.

Fig 44 gives a pleasing effect and illustrates clearly what has been said in respect to using weaves which take up the same amount of warp, the basis of the pattern is the five-end twill, 3 down, 2 up, in one part, 3 up, 2 down in the other part, the pattern is twice repeated in the ends, one complete pattern stands on twelve ends and five picks, if the stripes are made about half an inch wide, the pattern shows up much better, the black squares gives the lifting plan number one pick to go in first when,

the 1st, 2nd, 7th and 8th staves are lifted.

Second pick	2nd, 3rd, 6th, 7th, & 8th	„	„
Third	„ 3rd, 4th, 6th and 7th	„	„
Fourth	„ 4th, 5th, and 6th	„	„
Fifth	„ 1st, 5th, and 8th	„	„

Plate 6.



SPOT FIGURES.—Plate 6.

Spot figures can be made from twills by making an alteration in the looming and lifting.

Fig 45 is a spot figure made from the six-end twill 2 up 2 down 1 up 1 down, the twill is first made into a wave down the piece, and the ends drawn in point draft, the result is the spot figure 45, which is several times repeated; looking at the pattern it will be seen that the first six ends are all weaving different to each other, therefore six separate healds are required, the seventh end is weaving like the fifth; these two ends are therefore drawn on the fifth heald, the eight and fourth ends are alike, these two are drawn on the fourth heald, the ninth and third ends are alike, these are drawn on the second heald. The complete pattern stands on 10 ends and 10 picks; the lifting plan, which consists of the lifting of each separate heald, is shown by the black squares, number one pick to lead off. Any regular twill can be treated in the same way, and an immense variety of patterns obtained; so long as the looming is point draft, the size of the spot will be limited to double the number of ends and picks less two to what there are in the original twill from which they are made, in Fig 45 made from a six-end twill, the number of ends and picks in the complete pattern equals ten, or twice six less two equals ten.

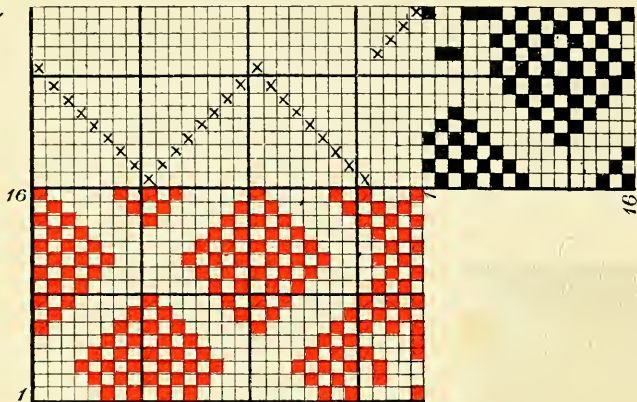
The spot figure can be increased in size to almost any extent without increasing the number of healds by altering the looming and pegging as shown at Fig. 46; the basis of this pattern is the four-end twill 2 up, 2 down, the looming is three times through from

front to back, and three times through from back to front, the complete pattern standing on twenty-two ends and twenty-two picks, the lifting plan as shown by the black squares, which is the lifting of the first four ends, for twenty-two picks.

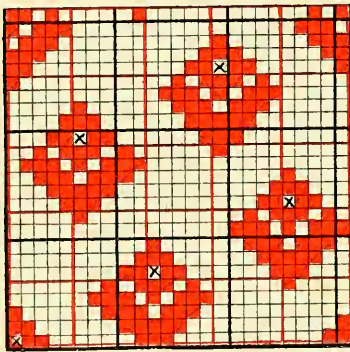
Fig. 47 is a spot made from the five-end twill, 2 up, 3 down, with a slight addition to fill up the centre of one of the spots, this prevents the weft floating over seven ends, and adds a little to the variety of the pattern, the lifting plan is shown in black.

Fig. 48 is a very common small spot figure standing on six ends and six picks, it is given to illustrate the looming ; it is advisable on the score of economy to weave a pattern on the least number of staves possible, but at the same time an irregular looming involves more time in looming the warp to commence with, and more trouble to the weaver when taking up broken ends, so that it is advisable to have the looming as regular as possible ; on this account, in Fig 48 the pattern with the looming as shown above the design, requires three staves only ; the lifting is shown in black ; it would be better in this case to use four healds, and have the looming point draft, 1, 2, 3, 4, 3, 2, 1.

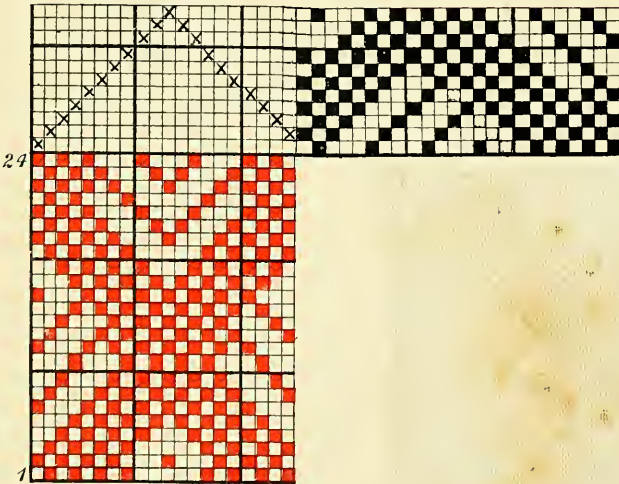
Fig. 49 is a small spot figure on eight staves, the spots have an alternate arrangement, bounded with small twill lines, the looming and lifting is shown in the usual way ; the twill line can be made thicker, or the spot assume a different shape so long as one half of the spot is like the other half ; the number of patterns made in this way, using different number of staves is almost illimitable.



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SPOT FIGURES. SAMPLES OF CLOTH.

Plates 7 and 8.

Fig. 50 gives a sample of cloth, a combination made from a small spot figure on nine staves, and a small corded weave on four staves; Fig. 51 gives the design with looming and lifting plan, the full width of the stripes are not given, but sufficient to show the repeat of the pattern; the small plain spot bounded with twill lines is intended to be plain throughout. This method of combining two different weaves is a fruitful source for new patterns.

Fig. 52 gives a small spot figure arranged in alternate order on a plain ground; Fig. 53 gives the design looming and lifting plan, using eleven staves with twenty-four picks to the round.

Spot figures after the style of Fig. 52 may be distributed over the piece in satin order; Fig. 54 shows a small spot figure which is given a five-end satin arrangement, the order of distribution being 1, 3, 5, 2, and 4, the five figures standing on 25 ends and 25 picks. The space is divided into small groups of 5 by 5, bounded by the red lines; a similar point is found in each red square for the centre of each figure as indicated by the black crosses.

To find the maximum size of figure which can be used so that one figure will not touch another, where a number of them are arranged in satin order, taking for example Fig. 54 the number of small squares in 25 by 25 equals 625, and five figure are required to stand on this space; the number of spaces for each figure will equal 625 divided by 5 equals 125; to find the squared space 125 small squares occupy, extract the square

root which equals about 11, therefore the maximum sized figure which can be used will be one that stands on 11 by 11 small squares ; this would allow no space for ground weave to surround the figures ; after finding the largest figure which can be used, then any smaller figures may be used, depending upon the amount of ground required ; in Fig. 54 the size of the figure is 9 by 9, and this allows sufficient ground to make the pattern look effective, these spots can be surrounded with a ground weave of any style so long as the spot patterns and the ground weave both repeat on the same number of ends and picks.

Figs. 55, 56, 57 and 58 are other styles of all over spot patterns made with the looming point draft. They are given as suggestions for a large number of patterns which can be made on the same lines ; the lifting plan in each case is one half the pattern.

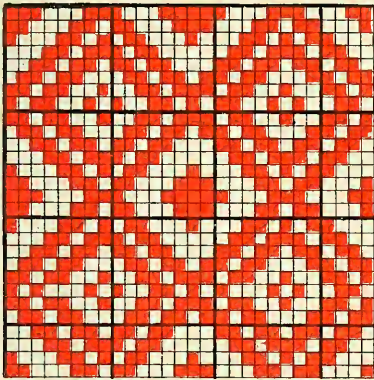
Fig. 55 stands on 14 ends and 14 picks, the lifting plan is the first 8 ends for 14 picks, 8 staves required.

Fig. 56 occupies 16 ends and 16 picks, the lifting plan being the first 9 ends for 16 picks, 9 staves required.

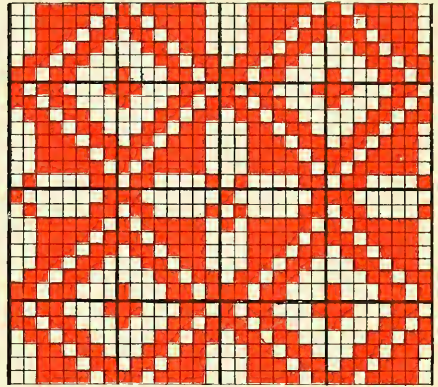
Fig. 57 stands on 26 ends and 26 picks, the lifting is the first 14 ends for 26 picks; 14 staves required.

Fig. 58 occupies 22 ends, 22 picks, the lifting plan is the first 12 ends for 12 picks; 12 staves required.

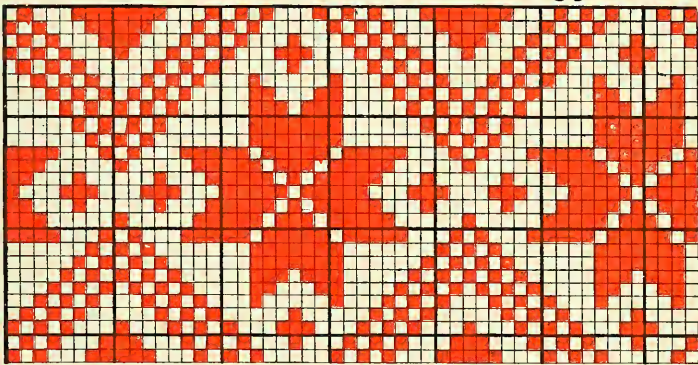
The looming in each of the four examples given is point draft.



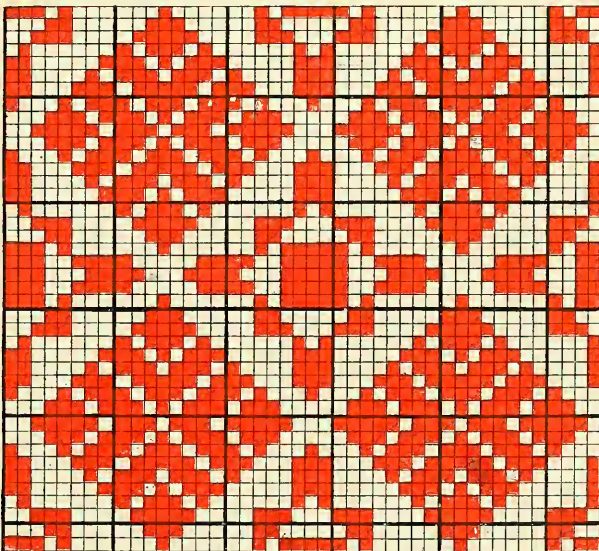
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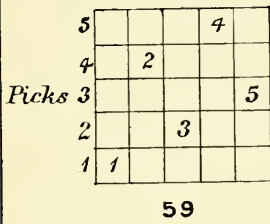
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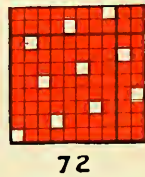
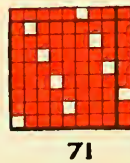
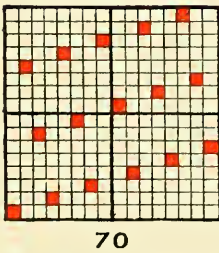
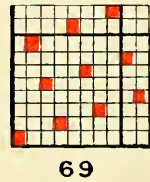
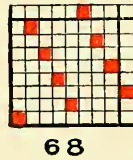
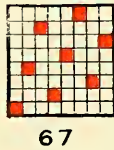
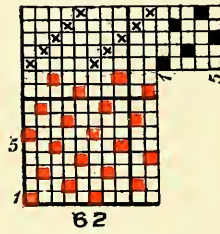
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61



SATINS—Plate 9.

These cloths are made from twills, the object aimed at being to produce a cloth with a greater proportion of the weft thrown to the face, in such a manner that no distinct line of twill can be seen, the points of intersection are not in consecutive order as in twills, but distributed over the pattern, so that the weft of one pick covers up the warp intersections of the previous pick.

The rules to be observed in finding the order of lifting for any satin are :—

1st.—Take for a basis any number which is not a measure of the whole number of healds employed, thus, 1, 3, 5, and 7 are numbers which are not a measure of 8 ; but 2 and 4 are measures of 8. Number 1 or the number one less than the number of healds employed cannot be taken, they would give twills.

2nd.—Let this number be such that it cannot be divided by any number which is a measure of the whole number employed, thus taking eight healds, 6 is not a measure of 8 but it is a number which can be divided by 2, and 2 is a measure of 8, so that 6 would not do for a basis for an 8-end satin.

3rd.—In placing the pattern on design paper mark the 1st square on the 1st pick, then miss as many squares less one as the number taken for a basis and mark that square on the next pick, and so on until every end and pick of the pattern is taken up.

Fig. 59 illustrates the order of lifting for a 5-end satin with a basis of 2 ; this number fulfils the conditions named above for five healds.

First pick, lift the first end.

Second „ miss one, lift the Third end.

Third „ „ „ „ Fifth „

Fourth „ „ „ „ Second „

Fifth „ „ „ „ Fourth „

The pattern on design paper is shown at Fig. 60.

Fig. 61 is a sample of cloth of a 5-end satin weave, the order of lifting is 1, 4, 2, 5, 3, as shown on design paper at Fig. 62, with a basis of three, the looming and lifting plan is given ; these two examples are generally woven with tappets, the ends drawn in straight over, and the order of lifting either 1, 3, 5, 2, 4, or 1, 4, 2, 5, 3, but an ordinary twill tappet lifting, Fig. 63, 1, 2, 3, 4, 5, will make the same cloth if the ends are drawn in 1, 3, 5, 2, 4 or 1, 4, 2, 5, 3, according to which pattern it is desired to weave.

In all satins the pattern is the lifting plan if the ends are drawn in straight through, at all times the lifting plan and looming are exchangeable, if the looming is irregular the lifting is straight, 1, 2, 3, 4, 5, and so on, if the looming is straight the lifting is irregular as 1, 3, 5, and so on.

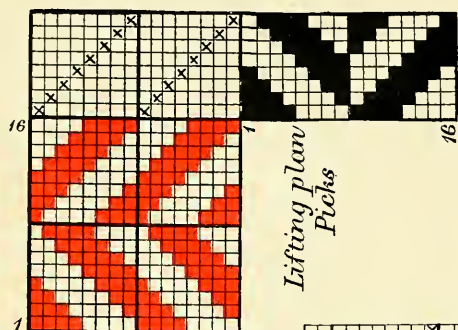
Satins can be made on any number of staves above three ; 4 and 6 give what are termed irregular satins, no number can be obtained for four and six healds, which fulfil the conditions named.

Fig. 64 gives lifting and pattern for 4-end satin or satinnet; this is irregular.

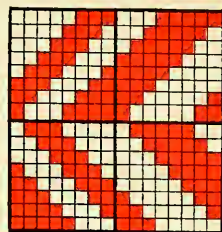
Fig. 65 illustrates lifting and pattern for 6-end irregular satin.

Fig. 66 illustrates a 7-end satin with a basis of three.

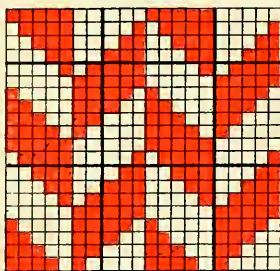
Fig. 67	„	8-end	„	„	„	„
Fig. 68	„	9-end	„	„	„	four
Fig. 69	„	10-end	„	„	„	three
Fig. 70	„	16-end	„	„	„	„



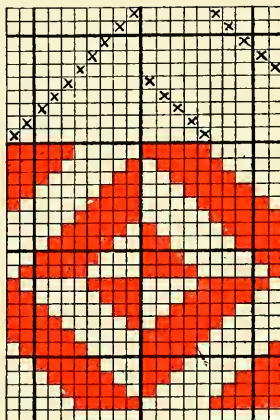
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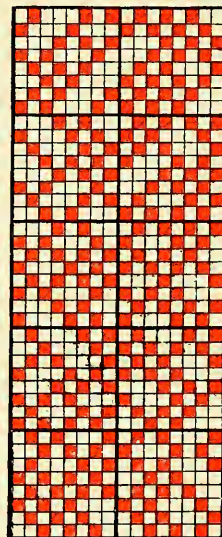
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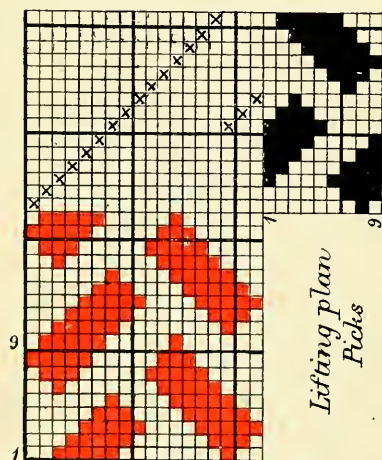
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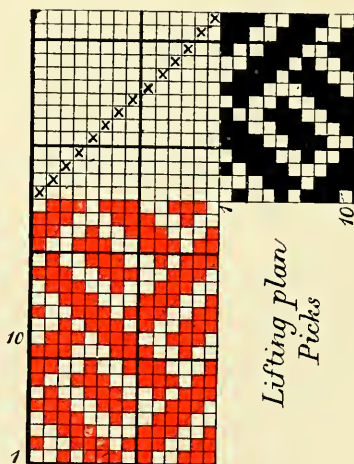
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Fig. 71 illustrates a 9-end warp satin, or the contrary side of the cloth to Fig. 68.

Fig. 72 illustrates a 10-end warp satin, contrary side of the cloth to Fig. 69.

In making satins, generally more ends and picks per inch are used than in plain cloth.

BROKEN TWILLS.—Plate 10.

Figured effects may be obtained from twills in a variety of ways. Fig. 73 gives one example using eight healds, the twill 4 up, 4 down, is allowed to run for eight picks in one direction, it then breaks off and runs for eight picks in the opposite direction, the pattern is repeated, the crosses indicate the looming and black squares the lifting plan.

Fig. 74 gives another example on sixteen staves ; the 16-end twill, 5 up, 3 down, 3 up, 5 down, is run for eight picks it then breaks off and runs in the opposite direction for eight picks, 5 down, 3 up, 3 down, 5 up, the same order of interweaving as before, only showing the contrary side of the cloth, the looming is straight draft and the pattern the lifting plan.

Fig. 75 is a pattern derived from the 10-end twill, 5 up, 5 down, only five threads are taken, it then breaks off and runs in the opposite direction, the complete pattern stands on ten ends and ten picks.

Fig. 76 is another pattern derived from the 10-end twill, 5 up, 5 down, it takes four complete 10-end twills arranged in different ways to make the new pattern, ten staves with the ends drawn in as shown, the first ten ends for twenty picks is the lifting plan.

Fig. 77 is derived from 9-end twill, 5 up, 4 down. It is considerably altered so as to make a kind of small spot figure, the complete pattern stands on eighteen ends and nine picks, if the looming was straight through from front to back the pegging plan would be the pattern for nine picks to the round, but this pattern can be woven on a less number of staves than what there are in the pattern, the 7th, 8th, and 9th ends in the pattern are weaving like the 16th, 17th, and 18th, so that these six ends can be drawn on three staves, the crosses indicate the looming to weave the pattern on the least number of staves, and the black squares the lifting plan.

Fig. 78 is derived from the 5-end twill, 3 up, 2 down, the pattern stands on 14 ends and 10 picks, the crosses indicate the looming and the black squares the lifting plan. Crepes or Oatmeal patterns may be placed under this head, they look best when woven in coarse yarns, and give as their name implies an effect as though coarse oatmeal had been scattered on the face of the cloth, the cloths are largely used for printed cretonnes, for curtains, and furniture coverings; the pattern also forms a useful ground weave for spot figures, or large patterns when using the jacquard.

Fig. 79 gives an example of an oatmeal pattern woven on sixteen staves, straight draft, the design being the lifting plan, the complete pattern requiring 40 picks.

Satins may be called broken twills as it is possible to weave them by lifting the healds in twill order, the ends being drawn in irregular or in satin order.

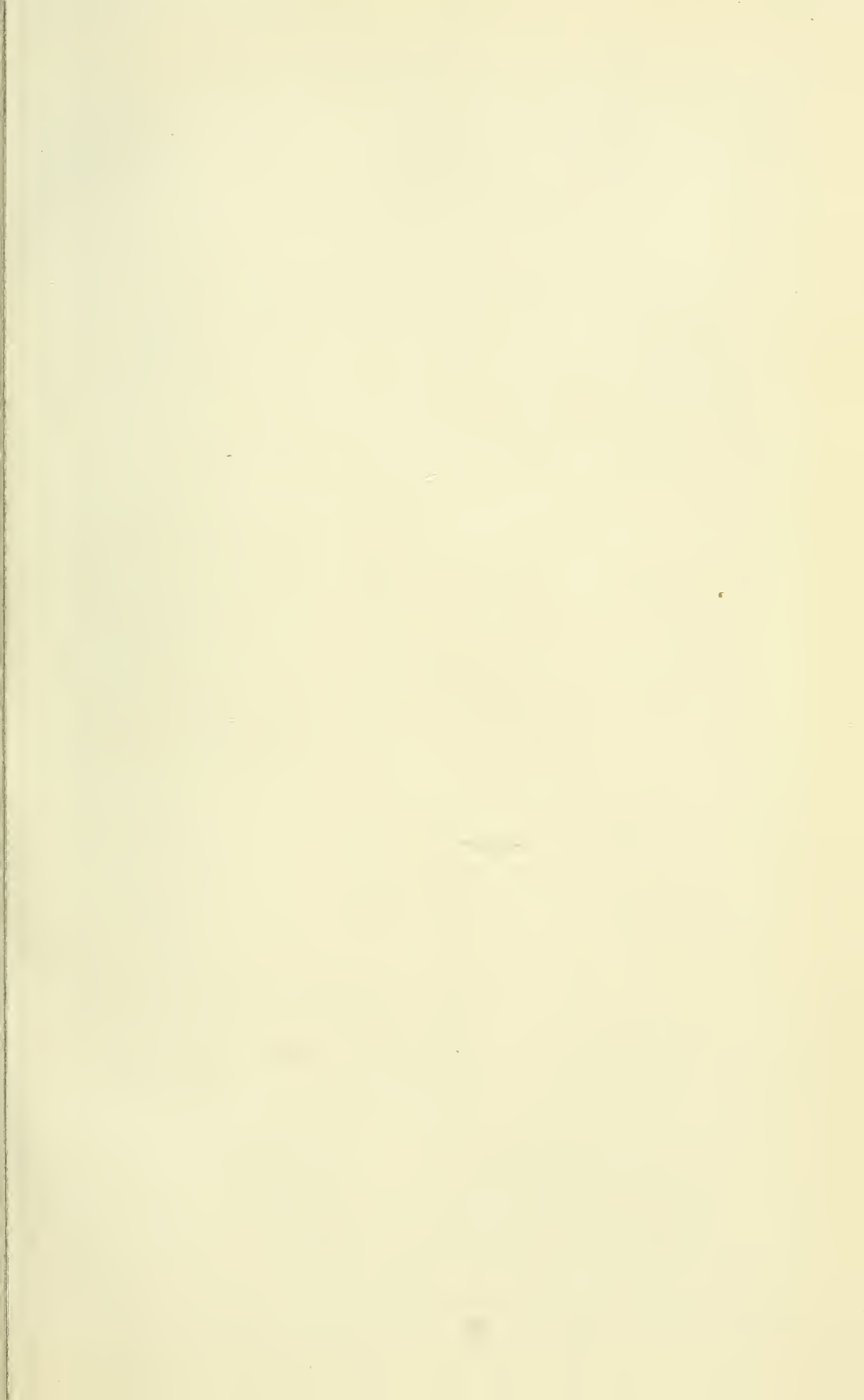


Plate 11.



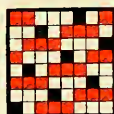
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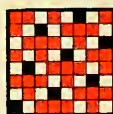
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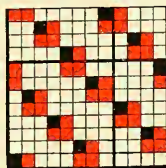
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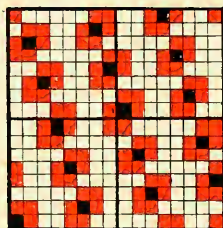
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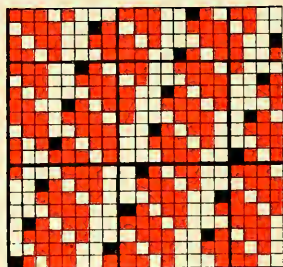
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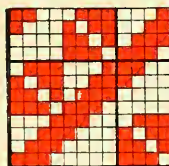
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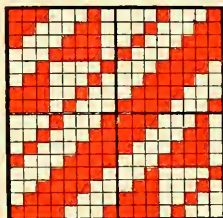
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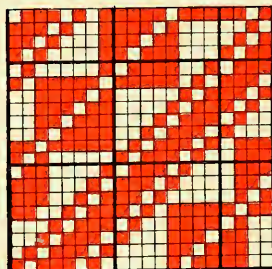
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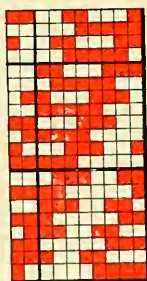
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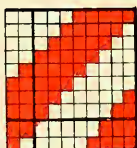
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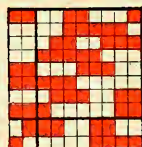
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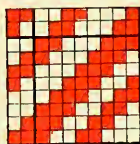
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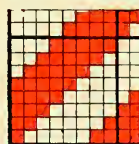
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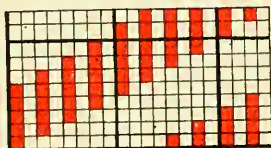
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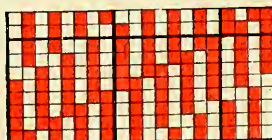
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PATTERNS DERIVED FROM SATINS & TWILLS.

Plate II.

A class of small figuring weaves derived from Satins are known as "**Granite Weaves.**"

Fig. 80, the black dots indicate the lifting for a 5-end satin, and forms the basis for the new pattern, obtained by adding a red square to every one of the black ones.

Fig. 81 the black dots give the lifting for a 8-end satin, one red square added to every black one gives the new patterns, these two examples are known as double satins.

Fig. 82 gives two red squares added to every black one.

Fig. 83 „ three „ „ „ „

Fig. 84 „ four „ „ „ „

Fig. 85 is a pattern obtained from the 12-end satin with a basis of five, three red squares are added to every one of the black ones.

Fig. 86 is based on the 16-end satin with a basis of five, with six red squares added.

Fig. 87 is based on the 20-end satin with a basis of seven with ten red squares added.

In these examples the black and red squares indicate warp lifted, just the same as if only one colour was used.

Fancy Twills are patterns derived from twills; a main line of twill with few ends up runs up the piece as shown at Fig. 88, with three ends lifted on each pick, the space between one line of twill and the repeat is then filled in with some small figuring weave as shown, the small figure must be one that contains a number of picks which is a measure of the number of picks in the twill, in this example the picks in the twill are twelve, the number of picks in the figure four, the

figure is three times repeated, so that both figure and twill are complete on twelve picks.

Fig. 89 is based on the 16-end twill, the small figure repeats on every four picks, the completed pattern standing on sixteen picks.

Fig. 90 stands complete on twenty ends and twenty picks.

Combination Twills, are the result of combining two twills together for the purpose of producing another pattern, entirely different to either of the two patterns used.

Fig. 91 is a 10-end twill.

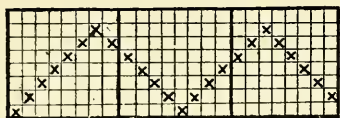
Fig. 92 is another 10-end twill.

Fig. 93 is a new pattern of twenty picks to the round obtained by taking one pick from Fig. 91, the next pick from Fig. 92 and so on until every pick is taken up. Instead of taking a pick from each pattern, each alternate pick may be taken as shown at Fig. 94, only five picks are taken from each pattern, the odd numbered picks are taken from Fig. 91 and the even numbered picks from Fig. 92. The two twills may be arranged end and end, or each alternate ends, or the ends and picks may be taken in satin or any other regular order to produce new patterns.

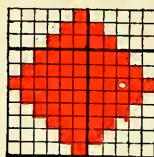
Corkscrew Twills are made by re-arranging the threads of a regular twill, or combining two regular twills in such a manner as to bring up the warp well to the face, to look effective they must contain more threads than picks per inch.

Fig. 95 is a 10-end twill, 5 up, 5 down.

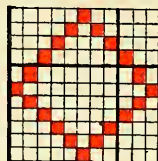
Fig. 96 is Fig. 95 arranged on the space of twenty ends, a blank line of spaces is left between every pair of ends ; in Fig. 97 the blank spaces are filled in with the same pattern, commencing from



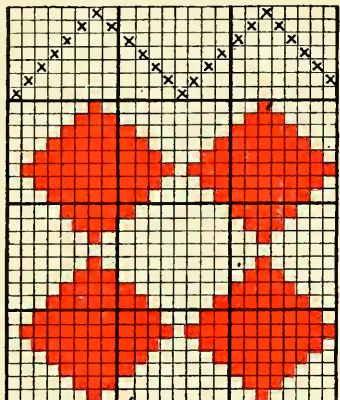
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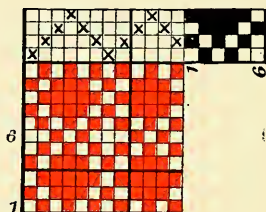
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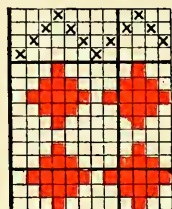
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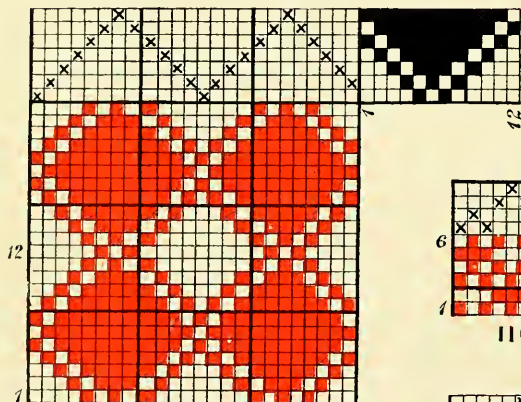
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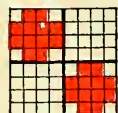
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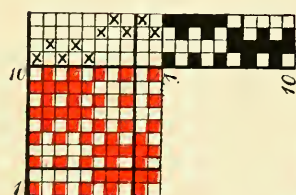
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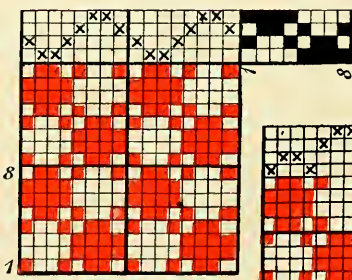
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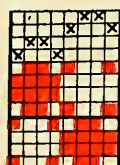
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the seventh thread, afterwards taking each thread in rotation, the blank spaces of one thread coming opposite to the filled-in squares of the next thread. Two distinct twills each on the same number of ends may be taken and arranged in the same way. In all the examples given on plate 11 the lifting plans are the patterns with the ends drawn in straight draft.

HONEYCOMBS & MOCK LENOS.—Plate 12.

Honeycombs are very common patterns extensively used in the making of Towels, using coarse yarns they make a spongy cloth well suited for the purpose; they can be made on any number of staves from four upwards, they are generally made with the ends drawn in point draft; assuming that it is required to make an honeycomb pattern on seven staves put down the looming as shown at Fig. 98, make the spot figure 99, and note that the number of filled-in squares on each side of the spot equals six, or one less than the number of healds used, make Fig. 100, which is the outline of Fig. 99; arrange the Figs. 99 under the centre end of the looming as shown at Fig. 101, the distance from one spot to the other when the same are repeated equals one, the empty spaces between one spot and another is now filled in with Fig. 100 as shown at Fig. 102, which gives the completed pattern repeating with looming and lifting plan.

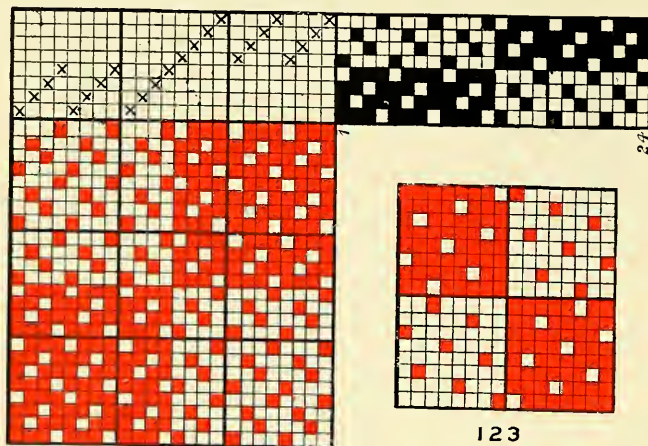
Fig. 103 gives a repeated pattern on four staves with looming and lifting plan, it is made from the two small Figures 104 and 105; Fig. 106 shows the spots arranged under the centre ends of the looming, Fig. 103 gives the completed pattern.

Mock Lenos or Imitation Gauze are patterns producing effects somewhat similar to guaze or cross weaving, this is brought about by the threads and picks

running together and producing an open or perforated effect in the cloth, those threads which run together are placed in one dent, and the imitation is more perfect if one or two empty dents are missed between one group of threads and another, but reeded in the ordinary way two ends in a dent, the effects are very good in using this weave in combination with others for the ground or Figure in jacquard woven cloths, the result is a close imitation of gauze weaving.

Fig. 110 is an example of mock leno on four staves, loomed three ends in a dent, the first three ends in the first dent the next three in the second dent, or if a dent is missed, in the third dent; it is made up from the two small weaves Figs. 107 and 108, one of which is the reverse of the other, Fig. 107 is placed on design paper as shown at Fig. 109; Fig. 108 is then filled in as shown in the completed pattern Fig. 110 which also illustrates the looming and lifting plan.

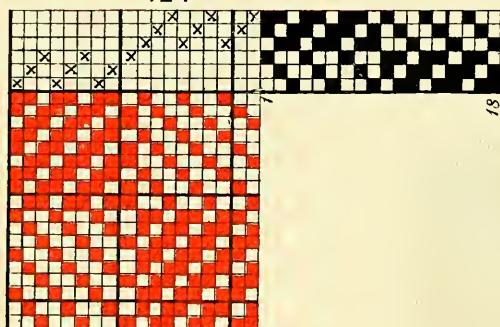
Fig. 114 gives a completed pattern on four staves, Figs. 111 and 112 the two small weaves from which it is made, and Fig. 113 illustrating the first step for construction, the same as in the previous example, in Fig. 114 the completed pattern the crosses indicate the looming, which in actual practice would not be so good to follow for the loomer and weaver as the looming given above the same pattern in Fig. 115 whenever there is choice of two methods of looming a pattern, it is advisable to adopt the method which is easiest to understand; the lifting plan is shown by the black squares; this pattern may be loomed the first four ends in the first dent, the next four ends in the second dent, or if a dent is missed in the third dent, if no empty dents are missed, a coarse reed may be used. Checked



124

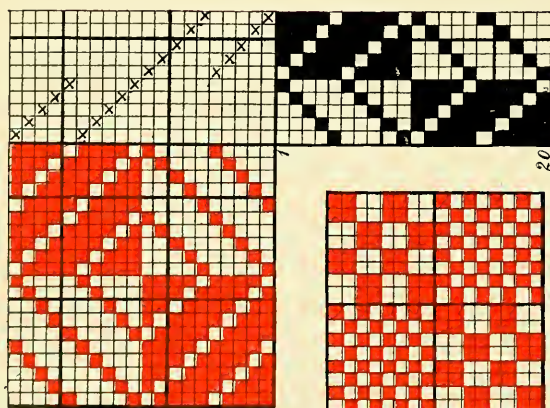
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effects plain and mock leno can be made, even if empty dents are missed, on the checks weaving mock leno the threads and picks run together in groups, when the same ends begin to weave plain, the interlacing of the weft keeps the threads apart, so that no extra large space appears between one thread and another.

In combination with other Figures it may form stripes down or diagonal lines across the piece.

Fig. 116 gives another example with looming and lifting plan, it is made up from the two weaves Figs. 117 and 118, the blanks in one of these figures corresponding to the filled in squares of the other Figure, as pointed out in the construction of the other examples.

WARP & WEFT CHECKS.—Plate 13.

These cloths are made in a variety of ways, many of the patterns have a twill or a satin basis, generally the figure of one check is produced by the warp, the figure on the next check by the weft.

Fig. 119 gives a simple pattern on eight staves, on two of the squares there is a greater proportion of warp than weft, on other two squares there is a greater proportion of weft than warp, this will give to the cloth the appearance of a checked effect, but the checked effect is more pronounced in a pattern standing on a greater number of threads and picks. The size of the check can be increased to almost any reasonable extent by an alteration in the looming and lifting.

Fig. 120 is a pattern based on the 3-end twill 2 up and 1 down, on two of the checks this is the weave; on the other two checks the reverse of this 2 down 1 up, each check now stands on 9 ends, brought about by going three times through from front to back on the first three staves then three times through from front to

back on the next three staves, if the looming is altered to six times through on the first three staves then six times through on the next three staves each check will stand on eighteen ends and picks, so that the number of times through multiplied by the number of healds used gives the number of ends and picks each check will occupy; the black squares in Fig. 120 gives the lifting plan.

Fig. 121 gives a sample cloth made on ten staves sometimes known as the "draught board pattern;" the pattern on design paper is given at Fig. 122, the crosses indicate the looming and the black squares the lifting plan.

Fig. 123 is based on the eight-end satin two checks show a preponderance of warp and two checks a preponderance of weft, the looming is straight through on sixteen staves, and the pattern is the lifting plan.

Fig. 124 gives a checked effect made from the four-end satin, each check stands on twelve ends and twelve picks, brought about by the looming as shown above the pattern, the black squares give lifting plan on twenty-four picks.

Fig. 125 is a very common pattern, requiring sixteen staves the ends drawn in straight draft, the pattern giving the lifting plan.

In every one of the patterns given it will be noticed that the filled-in squares of one check come opposite to blanks of the adjacent check, this completely separates one check from the other, preventing the weft of one interfering with the warp of the other.

Fig. 126 gives a check made up from plain and a small basket weave, eight staves will be required with the ends drawn in twice through on the first four

Plate 14.



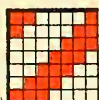
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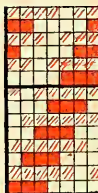
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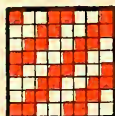
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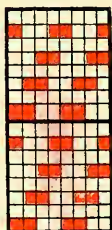
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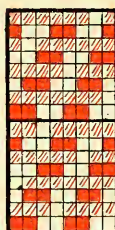
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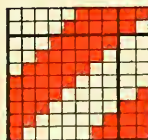
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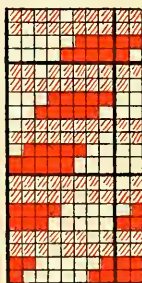
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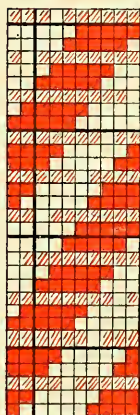
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staves then twice through on the next four staves, the lifting plan is the first four ends and the 9th, 10th, 11th, and 12th, for sixteen picks to the round.

A great variety of patterns can be obtained by combining different twills and satin weaves, varying the size and position of the checks, and departing from checked effects proper, diagonals, stripes, and small figured effects can be developed in the same way as the checks.

WEFT BACK CLOTH—Plate 14.

In these cloths there are two separate wefts and one warp one weft interlacing with the warp forms the figure on the face of the cloth, the other weft interlacing with the warp forms a backing or lining to the cloth, if two separate counts of yarn are used the back weft is softer spun than the face weft, if the extra weft is used for backing only, the manner in which it is bound to the cloth is generally in satin or some other loose order, if the extra weft is added to make the cloth a reversible one, then a firmer interweaving is required; the shaded squares give the lifting for the back picks.

Figs. 127, 128, and 129 illustrate the way in which a 5-end satin is backed with weft.

Fig. 127 illustrates an ordinary 5-end satin 1 up 4 down on each pick, giving a weft face four-fifths of the weft is thrown to the face and four-fifths of the warp is thrown to the back on each pick, the weft will show on the face and the warp on the back of the cloth; it is required to back this cloth with weft so that a preponderance of weft will show on both sides of the cloth, it can be done by lifting the healds in this order, First pick 1 up 4 down four-fifths of the weft is thrown to the face.

Second pick 4 up 1 down, four-fifths of the weft is thrown to the back.

Third pick 1 up 4 down four-fifths of the weft is thrown to the face.

Fourth pick 4 up 1 down four-fifths of the weft is thrown to the back.

And so on until ten picks have been inserted, by this means a cloth is obtained which shows weft on both sides of the cloth ; to enable the weft to cover well on both sides of the cloth, the picks must overlap, the number of picks per inch being double to what would be required for the ordinary 5-end satin.

Fig. 128 illustrates the face weave arranged on its own picks.

Fig. 129 gives the completed pattern, the solid red squares indicating the face picks the shaded squares the back picks.

In placing the patterns on design paper points must be selected so that the binding points of the back weft will be covered with the overlapping of the picks of weft belonging to the face before and after, so as to prevent the back weft showing on the face ; select the binding point in the middle of the face weft float if possible. Also let each thread take part in binding the back weft to the cloth, if there are two lines of twill in the face cloth let the binding points follow the weft twill lines, and let each twill line take its fair share of the binding.

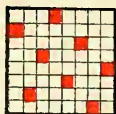
Fig. 130 is a 7-end twill Fig. 131 shows the same pattern arranged on each alternate pick Fig. 132 shows the completed pattern backed with a 7-end twill 6 up 1 down. Solid squares indicate face picks shaded squares back picks.

Fig. 133 is a repeated 4-end twill, Fig. 134 gives the same pattern arranged on each alternate pick,

Plate 15.



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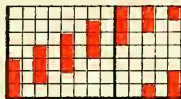
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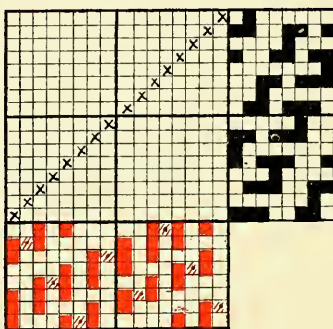
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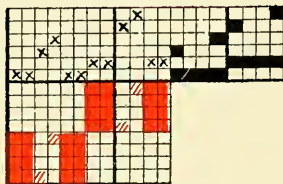
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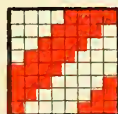
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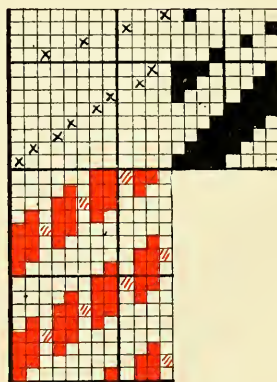
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Fig. 135 the completed pattern backed with an 8-end satin on a basis of five, missing four threads between each binding point; the bindings follow the line of twill.

Fig. 136 is a 10-end twill 5 up 5 down, Fig. 137 gives the same pattern arranged two face picks one back pick the manner of binding is not exactly in satin or twill order for the back weft, but it is the best arrangement for allowing each thread to take its share in binding, and for the binding points to be covered with the face weft.

Fig. 138 is the same pattern arranged two face two back the binding points are not selected in regular twill or satin order, but in such positions as to be covered with the face weft, a very soft backing weft must be used to enable the weft face to cover well. In all the examples given on this plate the patterns are the lifting plans with the ends drawn in straight draft.

WARPED BACKED CLOTHS.—Plate 15.

These cloths have a backing of warp in the same way as weft backed cloths are backed with weft, the two sides of the cloth may be of different colour or of different counts of material, there is one kind of weft interlacing with both the face and back warps, for the purpose of illustrating the principles of this class of weaves Figs. 138, 139, and 140 are taken.

Fig. 139 is an eight end warp satin with seven eighths of the warp floating on the face.

Fig. 140 is an eight end satin with seven eighths of the warp floating on the back.

Fig. 141 shews Figs. 139 and 140 combined, the first end of the pattern remains up for seven picks and down for one, the bulk of the thread is thrown to the face, the second-end comes up only once out of eight picks as shown by the shaded squares. The bulk of

this thread is thrown to the back. The third thread shows on the face, the fourth behind and so on all the way across the piece, one half of the warp is thrown to the face and the other half to the back of the cloth; to enable the weft to lie between the two warps and be completely covered double the number of threads per inch are required to what are used in making the ordinary cloths.

The back warp is generally loosely bound to the cloth, so that the threads are easily forced behind.

The raising of the back warp is brought up at a point where the two threads belonging to the face cloth, situated one on each side are lifted at the same time, this tends to cover the binding point and prevents the back warp from showing on the face.

Fig. 142 gives a seven-end twill; Fig. 143 is the same pattern placed on design paper; using each alternate end; Fig. 144 shows the backing ends filled in with shaded squares, it will be seen that whenever a back end is lifted, the threads belonging to the face cloth and situated on each side of it are lifted at the same time.

Fig. 145 gives an 8-end pattern showing two lines of twill; Fig. 146 is the same pattern arranged on each alternate end; Fig. 147 shows the spaces missed in the first case filled in with backing ends shaded squares, the binding taking up each line of twill, and in satin order with a basis of five; the looming is given as straight draft, the lifting plan in black squares the same as the pattern.

Fig. 148 is a small basket weave, and Fig. 149 show the same pattern arranged four face ends two back ends the shaded squares indicate back ends, the crosses the looming which is somewhat irregular the black squares the lifting plan.

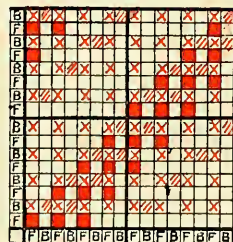
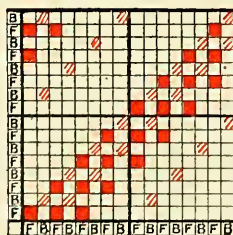
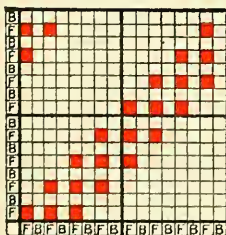
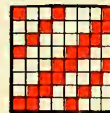
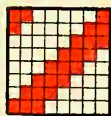
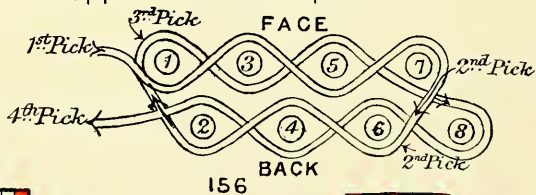
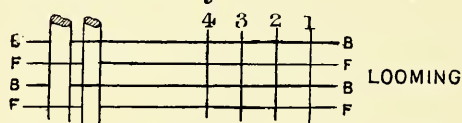
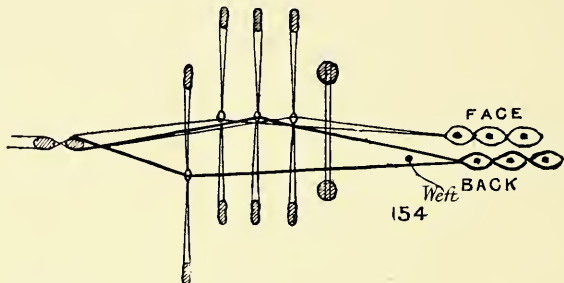
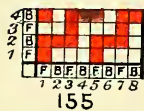
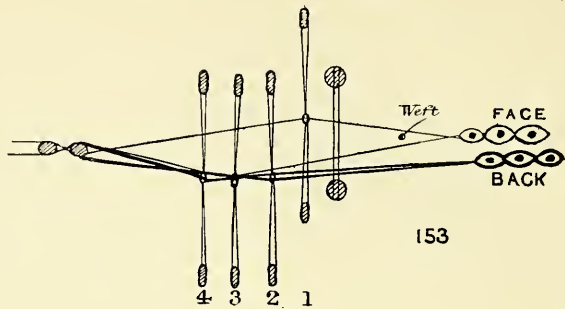
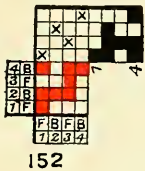


Fig. 150 gives an 8-end twill 4 up 4 down ; Fig. 151 shows the same arranged two face ends one back end, the pattern repeating in picks ; the shaded squares give the lifting of the back ends ; this pattern could with advantage be loomed straight through the same as Fig. 147 the pattern to be the lifting plan ; but it is loomed so that the first eight staves weave the pattern for the face cloth and the back four staves weave the pattern for the back cloth, the lifting plan with this looming is given in black squares.

DOUBLE CLOTH.—Plate 16.

What is meant by double cloths is two separate and distinct fabrics woven in the same loom, one cloth superimposed upon the other, it may be that the two warps are of different counts or colour of material, the two wefts the same colours and counts the two cloths may be connected at each selvege, so as to make a long bag or tube, or they may be connected at one selvege only, and when taken out of the loom the piece opens out to double the width, or the two cloths may be stitched together in the weaving, by allowing some threads of the back cloth to interweave with the face cloth, or some of the threads belonging to the face cloth interweaving with the back cloth.

To make the matter clear the simplest form of double cloth weaving will be taken ; four healds are required, Figs. 153 and 154, these are divided into two sets, of two healds each, the front two healds weave the face cloth, the back two healds the back cloth ; the ends are drawn in—

First end first heald.

Second end third heald.

Third end second heald.

Fourth end fourth heald.

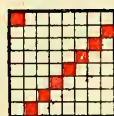
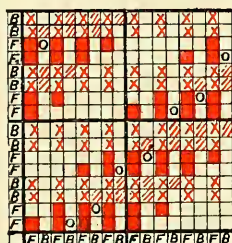
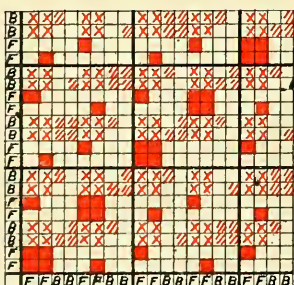
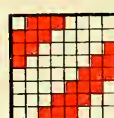
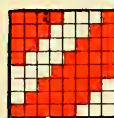
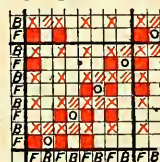
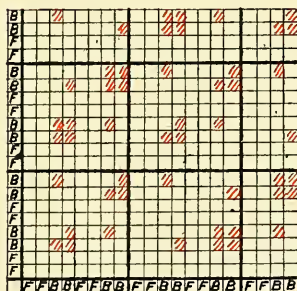
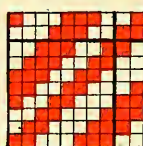
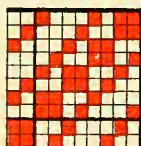
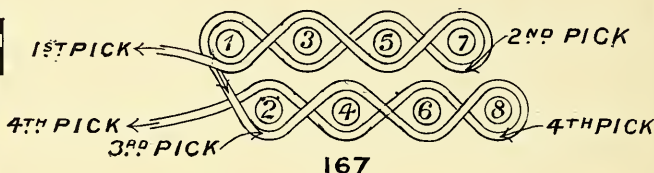
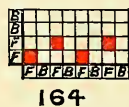
Fig. 152 gives the design, the red squares indicate the pattern weaving a plain face and plain back, the black squares the lifting plan, crosses the looming ; all the odd numbered ends as indicated by the letter F are face ends, all the even numbered ends as indicated by the letter B are back ends, the letters F and B opposite to the picks indicate face and back picks respectively ; on the first pick Figs. 152 and 153 a face end is lifted, a face pick put in, the back ends drawn through healds three and four, and half of the face warp drawn on the second heald remaining down ; second pick Figs. 152 and 154 the whole of the face warp drawn through healds one and two, also one half of the back warp drawn on the third heald is lifted and a back pick inserted ; third pick the second heald is lifted, the healds carrying the back warp remaining down, another face pick inserted ; fourth pick the healds one and two are lifted bringing up the face warp, also the fourth heald bringing up one half of the back warp, a back pick put in, and so on repeating.

Fig. 155 gives the same pattern repeated to eight ends, the odd numbered ends are face ends the even numbered ends back ends. Fig. 156 gives a section of the cloth the interlacing lines represent the four picks of weft the eight numbered circles the eight warp ends ; commencing with the first pick the arrows indicate the direction taken by the weft, making a cloth in the form of a bag secured at each selvege.

In designing for these cloths, place each pattern for face and back separately on design paper, Fig. 157 gives a pattern for a face cloth, Fig. 158 the pattern for a back cloth.

Take a piece of design paper, Fig. 159, containing as many ends and picks as there are in Figs. 157 and 158 taken together, arrange the threads and picks one

Plate 17.



face one back as indicated by F's and B's, place the pattern for the face cloth on its own ends and picks in solid red squares, omitting every back end and back pick Fig. 159.

Arrange the pattern for the back cloth on its own ends and picks shaded squares Fig. 160. Lift all the face ends up on every back pick as indicated by the crosses, Fig. 161.

The design is now completed, the woven cloth will be in the form of a bag, closed at each selvege with Fig. 157 the pattern for the face cloth, and Fig. 158 the pattern for the back cloth; the ends drawn in straight draft the pattern is the lifting plan; the direction of the twill for the back cloth will run in the opposite direction to what is shown in Fig. 158.

DOUBLE CLOTHS—(continued). Plate 17.

If a cloth is required to open out to double the width, that is, secured at one selvege only, the arrangement is then one end face, one end back in the warp, two picks face two picks back in the weft; Fig. 162 is the face cloth plain, Fig. 163 the back cloth plain, each carried to four threads; Fig. 164 gives the face cloth arranged on its own ends and picks solid squares; Fig. 165 gives the back cloth arranged on its own ends and picks shaded squares; Fig. 166 gives the completed pattern the red crosses indicating face warp lifted on back picks; Fig. 167 gives a section of the cloth the interlacing lines represent the four picks, commencing with the first pick the arrows indicate the direction taken; the numbered circles indicate the eight warp ends.

Patterns may be arranged one face one back in ends and picks or two face two back in ends and picks; Fig. 172 gives an arrangement two face two back in ends and picks; Fig. 168 is a pattern for the face cloth;

Fig. 169 is a pattern for the back cloth ;

Fig. 170 illustrates the face cloth arranged on its own ends and picks, solid squares ;

Fig. 171 illustrates the back cloth arranged on its own ends and picks shaded squares ;

Fig. 172 gives the completed pattern the crosses indicating face warp lifted on back picks.

When the two cloths have to be bound together in the weaving due regard must be paid to the two weaves used for face and back, to prevent one cloth from taking up more than the other, and producing a cockling effect where the two cloths are bound together. two methods are in use to bring about the binding, one method is to allow some of the face ends to be left down on a back pick, the other method to lift some of the back ends on a face pick, the latter method is here taken to illustrate the examples given. whenever a back end is lifted in a face pick, it must be brought up immediately before or after the same and has been lifted for the back cloth, and in such a position that there are two face ends belonging to the face cloth lifted at the same time, one situated on each side of the back end.

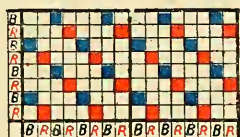
Fig. 173 is the pattern for the face cloth ;

Fig. 174 is the pattern for the back cloth ;

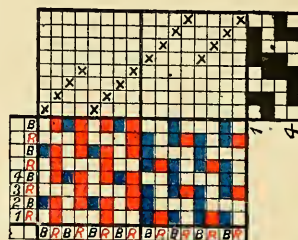
Fig. 175 gives the arrangement for binding ;

Fig. 176 illustrates the completed pattern the black circles indicating back ends lifted into face picks, solid red, face cloth ; shaded squares, back ; crosses, face ends lifted on back picks. In selecting the binding points, follow the line of twill or figure used for the face cloth.

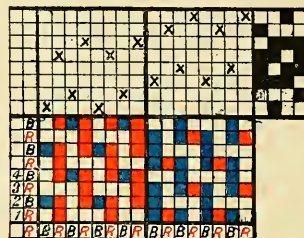
Fig. 177 gives an arrangement of one face one back in ends, two face, two back in picks.



182



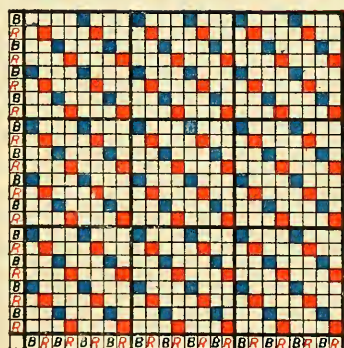
Red 181 Blue



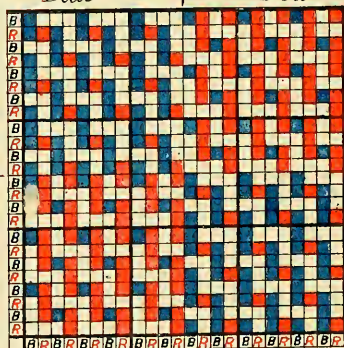
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Blue

Red



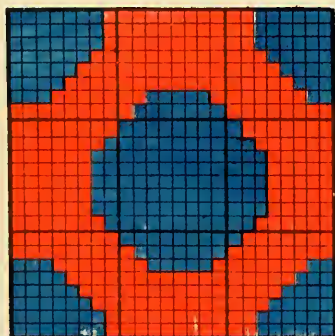
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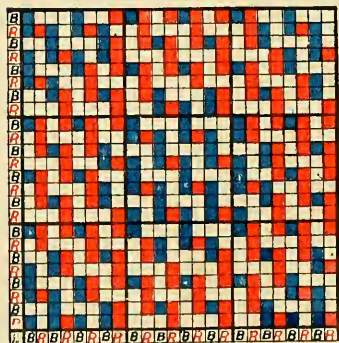
Red

184

Blue



186



187

Fig. 178 is the pattern for the face cloth ;

Fig. 179 is the pattern for the back cloth ;

Fig. 180 is the pattern for the binding.

Fig. 177 gives the completed pattern each pattern arranged on its own ends and picks, with face ends lifted on back picks to produce the double cloths, and the back ends as shown by the black circles lifted into the face cloth to stitch the two cloths together.

In all the examples given on this plate if the ends are drawn in straight draft the pattern is the lifting plan.

DOUBLE PLAIN CLOTHS—Plate 18.

Stripes, checks, and figured effects can be produced, which have a plain face and plain back, and coloured effects can be obtained by using two separate warps, say red and blue, and two separate wefts of the same colours. Each colour of weft interweaves with its own colour of warp, the two cloths changing places to bring about the pattern desired.

Fig. 181 gives a stripe pattern made in this way, and which will show on the face of the cloth, a red and blue plain stripe alternating, the red weft interweaving with the red warp only, the blue weft interweaving only with the blue warp ; on the back of the cloth behind the red stripe the blue weft interweaves with the blue warp making plain cloth ; and behind the blue stripe, the red warp and weft are interweaving making plain cloth, so that cloths of this description are reversible.

Arrange the patterns on design paper one end red one end blue, the letters R's and B's indicating the red and blue ends and picks respectively.

Whenever a red pick is inserted, all the blue ends are lifted on blue stripe, and when a blue pick is

inserted all the red ends are lifted on a red stripe

In the construction of Fig. 181 which is intended to illustrate the making of a red and blue striped cloth. Fig. 182 shows each cloth arranged on its own ends and picks, the red squares indicating the red warp the blue squares the blue warp.

Fig. 181 shows the completed pattern the red and blue threads lifted at the proper time ; on the first pick, a red pick of weft is inserted, and interweaves with the red ends, the blue ends being lifted on the blue stripe, the second pick a blue pick is inserted and interweaves with the blue warp the red ends being lifted on the red stripe, and so on repeating.

Fig. 183 gives a section of the cloth for four picks, the interlacing lines indicate the picks, the circles the different coloured ends.

Fig. 184 illustrates the making of a checked effect on twenty-four ends and picks.

Fig. 185 gives the different cloths arranged on their own ends and picks ; Fig. 184 is the completed pattern the blue warp lifted up on a blue square when a red pick goes in, and the red warp lifted out of the way on a red square when a blue pick is put in.

Fig. 186 is intended to illustrate the making of small spot figures alternately placed, to show on the face of the cloth a blue plain spot on a red plain ground on the other side of the cloth a red plain spot on a blue plain ground.

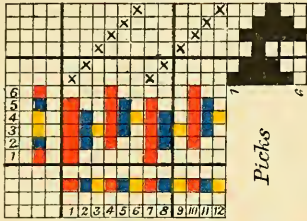
Fig. 187 shows the pattern arranged on design paper, the red and blue ends lifted at the proper time.

In the making of these cloths, the front healds may be loomed to carry one colour of warp the back healds the other colour of warp, the ends being alternated in the looming as in Fig. 188 or the ends may

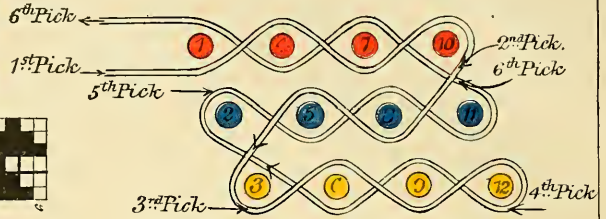
Plate 19.



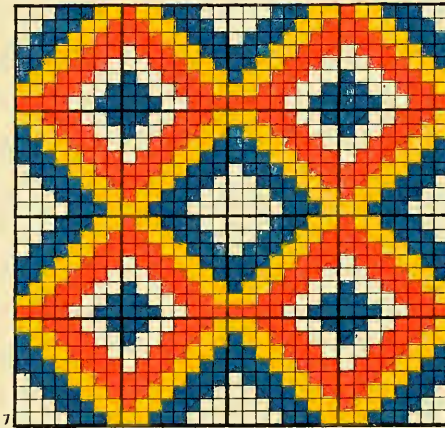
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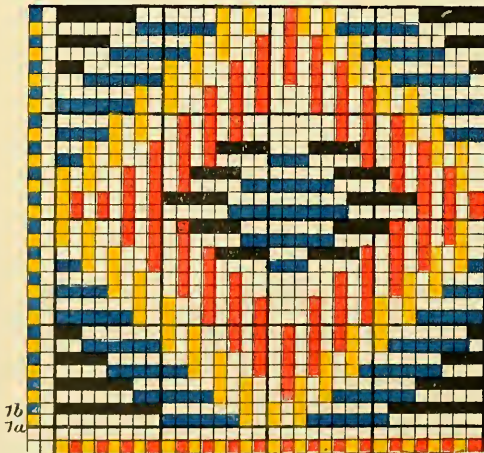
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bedistributed over the healds as shown in Fig. 181 and the lifting obtained as shown by the black squares ; whichever way is adopted the lifting will be obtained in the usual way from the design and looming combined.

DOUBLE CLOTHS.—Plate 19.

Two, three or four cloths may be made one on the top of the other in the same loom, and to open out when woven to two, three, or four times the width, or the cloths may be stitched together in the weaving so as to form one solid fabric.

Figs. 189, 190, and 191 illustrate the making of what is termed a three-ply cloth, three different coloured warps are used and one kind of weft which interweaves with each warp in turn, weaving plain cloth ; the colours are face warp red, middle warp blue, back warp yellow.

Fig. 189 shows the pattern for each cloth placed on its own ends and picks ; the bottom row of spaces filled in red, blue, and yellow, for twelve threads indicate the different coloured ends above them ; the row of spaces at the side filled in red, blue, and yellow, yellow, blue, and red for six picks indicate the weft when it interweaves with the different coloured warp.

Fig. 190 gives the completed pattern obtained by lifting the face warp (red) when a pick is put into the middle cloth (blue).

Lifting the face warp (red) and middle warp (blue) when a pick is put into the back cloth (yellow).

The black crosses indicate the looming straight draft and the black squares the lifting plan.

Fig. 191 gives a section of the cloth for six picks the interlacing line represents the weft, the twelve numbered circles indicate the twelve numbered ends taken from the pattern Fig. 190, the arrows indicate

the direction taken by the weft ; the cloth opens out to three times the width. The three cloths may be stitched by lifting a thread belonging to the middle cloth into a face pick, and lifting a thread belonging to the back cloth into a middle pick.

Four ply cloth is made in the same way as the above using four threads instead of three.

Tapestries, Curtains, and Hangings.—These are constructed on the double cloth principle, using one, two, or three different coloured wefts and two different coloured warps.

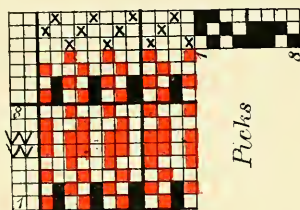
Fig. 192 is a small all over spot figure made with two wefts, white and blue, two warps red and yellow, the different coloured threads and picks are brought up at the proper time to produce the effect required, the cloth is reversible showing white beneath the blue, and blue beneath the white, the warps at these points lying between the two wefts, beneath the yellow warp is the red, and beneath the red warp the yellow, the weft at these points lying between the two warps, to enable the warp and weft to cover well, the threads weave in pairs four in a dent, and the weft is double, that is two threads run together on one pirn, and beaten well into the cloth.

Fig. 193 is the pattern on design paper to illustrate the lifting, the ends are one yellow one red alternating, the picks one white one blue alternating.

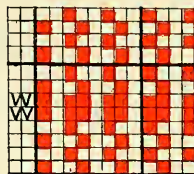
Each pick is cut or pegged twice, once for the white pick and once for the blue.

White pick (1a) all the red and yellow ends are lifted to suit the pattern, only those ends left down where the white weft is required to float over to suit the pattern, as shown on the first pick Fig. 192.

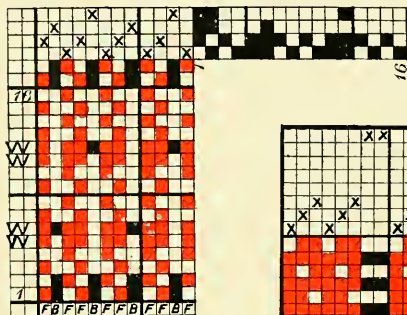
Blue pick (1b) all red and yellow ends lifted to



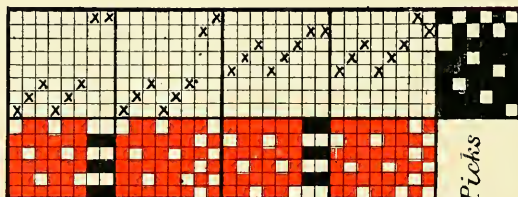
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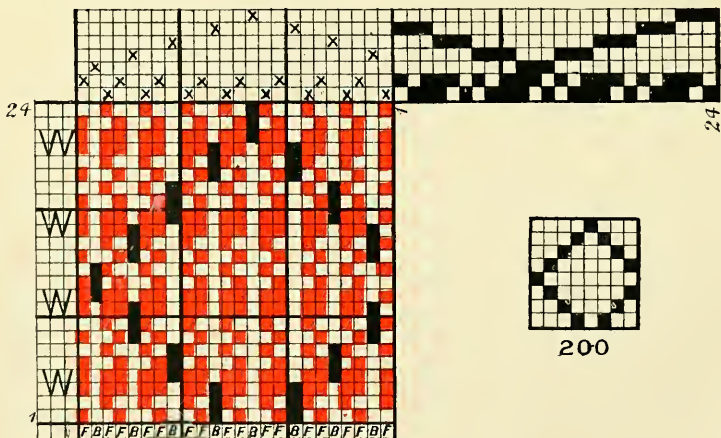
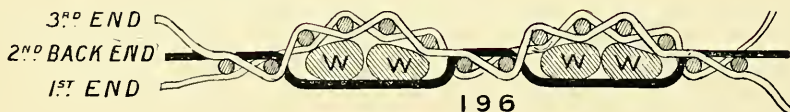
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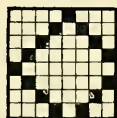
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suit the pattern, only those ends left down where the blue weft is required to float over to suit the pattern on the second pick Fig. 193 the dots on this pick indicate ends up to allow blue weft to go under, but the white picks on each side completely cover up these threads, so that they do not show through, and the same on pick one, the lifted threads as shown by the blue marks are completely covered by the blue picks on each of them.

DOUBLE CLOTHS.—Plate 20.

Other kinds of fabric such as Piques, figured and plain, Welts, Quiltings, Toilet Cloths, Bed Covers, and Matelasses are included under the head of double cloths, generally two kinds of warp and two kinds of weft are used in their production, the figures and patterns are produced in the cloth by allowing back ends to be lifted for two or three picks in succession into the face cloth, this stitching in regular order to suit a given pattern produces an embossed effect on the face of the cloth, this effect is more pronounced if two warps are used, the back warp heavily weighted, and picks of coarse weft termed wadding picks inserted at intervals between the two warps. Piques are cloths having a plain face, the proportion of face ends to back are two face one back, dented three ends in one dent, the back end occupying a position between two face ends in each dent; the patterns are shown woven on the least number of staves, but it will be advisable to use four instead of two for the face cloth.

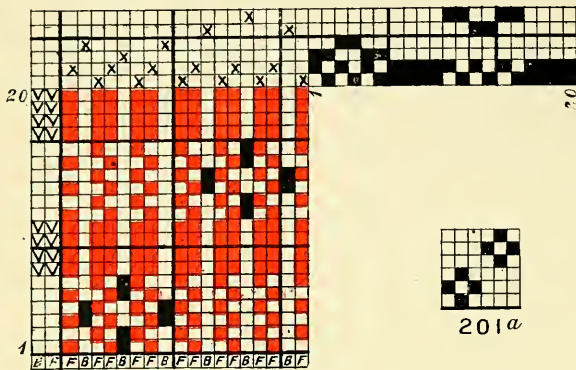
Fig. 194 gives a small pique pattern which forms a rib across the piece, this class of pattern is much used in the making of white ties.

Fig. 195 shows the pattern plain cloth placed on its own ends, with face ends lifted on wadding picks W.

Fig. 194 gives the completed pattern the black squares indicating back ends lifted into face picks, the looming is shown by the crosses, the lifting plan in black squares, the pattern standing on three staves eight picks to the round ; the points where the back ends are brought up into the face cloth, pulls down the face cloth forming a gut or division across the piece, separating one rib from another, the two wadding picks bring up the rib with more effect than would be the case if none were inserted.

Fig. 196 shows a section of the cloth, the interlacing lines represent three warp ends and the circles——picks of weft, the first and third ends of the pattern are taken from Fig. 194 and shown in section interweaving with the face picks in plain order, the second end which is a back end is lifted on the first, second, ninth, and tenth picks, at other times it is floating at the back of the cloth, and serves to keep the wadding picks five and six in position, when these two picks are inserted the face warp is lifted the back remaining down, the two picks then lie between the face and back warps.

Fig. 197 gives another ribbed pique, the back ends in addition to holding the wadding picks in position interweave with them in this order—first wadding pick W, all face ends lifted, all back ends down ; second wadding pick, all face ends and half the back ends up, this binds the cloth more firmly together four wadding picks are inserted in every rib, the arrangements being in picks eight face two wadding four face two wadding ; sixteen picks to the round



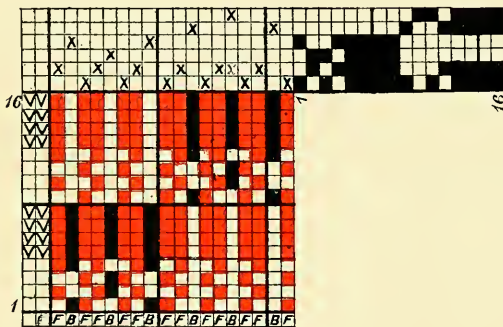
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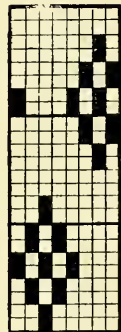
201a



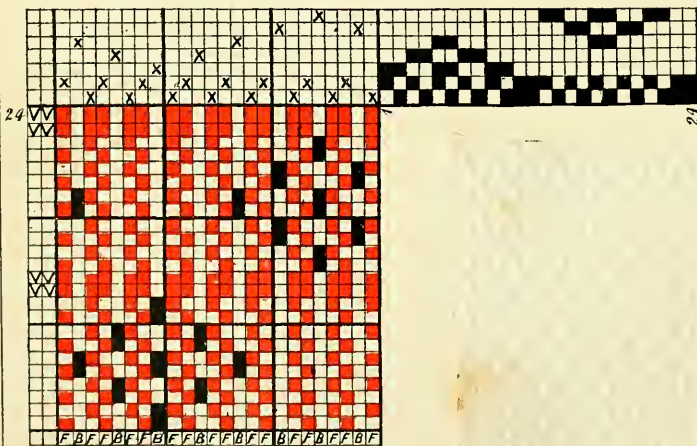
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Sometimes ribs are made down the piece, Fig. 198 gives an example using a one-shuttle loom, one or two thick ends taking the place of the wadding picks, these padding ends black squares lie between the face cloth, which is two and one twill, and the weft floating behind which holds them in position.

Fig. 199 gives a small diaper figure on the face of the cloth the arrangement is two face one back in ends four face two wadding in picks. Fig. 200 shews the order in which the back ends are brought up into the face cloth, each thread remaining up for three picks once for wadding and twice into the face cloth.

In large floral and other patterns of this class such as toiletings, the binding follows the outline of the figure, the veining of leaves, the petals of flowers and other parts where the cloth is required to be pulled in at the face to produce effect; the back warp in large patterns is allowed to interweave in plain order with the wadding picks, the order being, two fine picks face two coarse picks, one of which passes between the two warps for padding, the other interweaves with back warp forming plain cloth.

DOUBLE CLOTH.—Plate 21.

Fig. 201 gives a small pattern in common wear arranged two face one back in ends, six face four wadding in picks the order of binding the back ends to the face as indicated by the black squares is the means of pulling the wadding picks out of the straight line so that they assume a wavy appearance, the looming and lifting plan is given.

Fig. 201a shows the pattern for binding, each back end remaining up for two picks.

Fig. 202 is also another common weave, plain

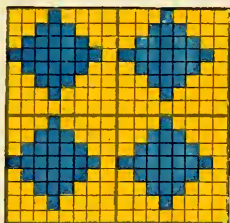
face, two face one back in ends, four face four wadding in picks.

Fig. 203 gives the order of lifting of the back ends into the face cloth, it will be seen as shown by the black squares in Fig. 202 that the back ends after being lifted into the face cloth, are also lifted for four picks when wadding picks go in, this gives to the wrong side of the cloth a mat effect, the looming and lifting plan is given above the pattern.

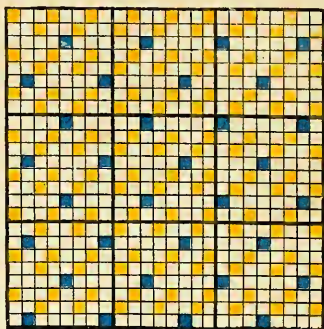
Fig. 204 is a sample of cloth and Fig. 205 illustrates the design on point paper along with the looming and lifting plan, the red squares face ends black squares back ends. In getting out the design from actual samples of cloth of this kind the following rules will be found useful. Find the proportion of face ends to back this can be done by counting on the wrong side of the cloth, the number of back ends per quarter inch, which is say 10 then pull away the back ends and wadding picks, count the number of threads per quarter inch in the face cloth which is say 20 or a proportion of one to two, that is two face one back in ends. Find the proportion of face picks to wadding which is ten face two wadding.

Find the weave for the face cloth (plain).

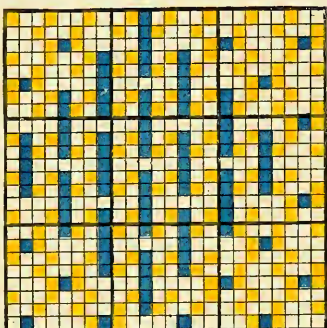
Find the lifting of the back warp into the face cloth, this can be done by taking a small part of the sample the wrong side up and pull out the ends one by one instead of the picks, noting down on paper with a filled-in square whenever the back end is taken into the face cloth, this is shown at Fig. 206 where no note has been taken of the face ends, this gives eight back ends in one repeat of the pattern, and allowing for wadding picks twenty-four picks in one repeat, there are two face ends for each back, therefore the number of



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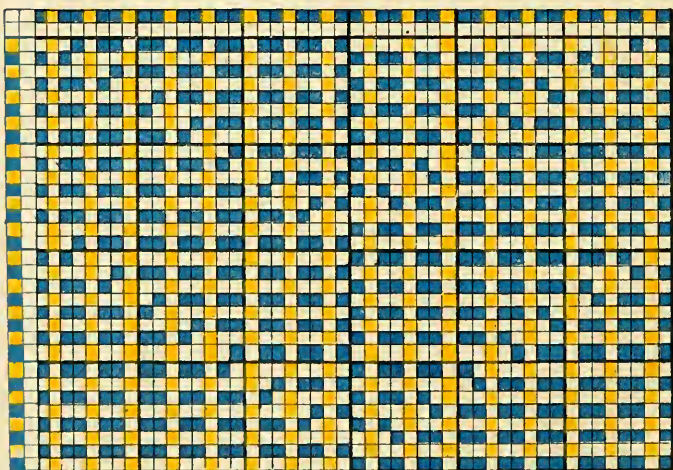
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ends on which the pattern will stand equal twenty-four, therefore arrange the pattern for face cloth on its own ends lifting face ends on wadding picks, then fill in the back ends with the order of lifting of the back warp taken from Fig. 206 and after putting down the looming an lifting the design is completed Fig. 205.

Matelasses are similar in construction to the cloths just given but of more elaborate pattern, they are made generally in silks, woollens, and worsteds for ladies' jackets and mantles, the face pattern instead of being plain may be any kind of figuring weave the arrangement of the ends is two face one back the face warp being finer than the back, the binding of the back warp to the cloth takes place all round the figure along veins of leaves and at other convenient points where it can be brought up without showing on the face; the picks are two fine for face cloth two coarse one of which passes between face and back warp for padding, the other interweaves with the back warp in plain or any other order.

DOUBLE CLOTHS.—Plate 22.

Other varieties of double cloths which take after the style of quiltings are made by using different colours and thickness of warp and weft; in Fig. 207, which represents a repeating spot figure, the blue spot is brought up on a dark yellow or orange ground, a very thick blue warp and weft is used, with a thin dark yellow or orange warp and weft.

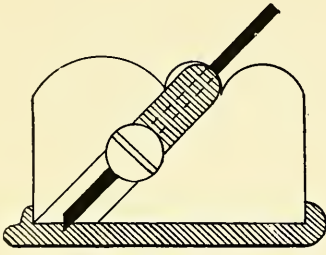
The proportions of warp and weft of the different colours used are two orange one blue in ends, two orange one blue in picks, the orange warp and weft interweave in plain order; the blue warp and weft weaves together forming plain cloth. Fig.

208 shows each warp and weft arranged on their own ends and picks. Fig. 209 gives the completed design for one spot only, the blue ends are brought to the face on each blue pick in the order required for the production of the pattern ; as the blue warp and weft is much thicker than the orange warp and weft, it is brought prominently to the face, the thinner warp and weft is forced behind and shows on the back of the cloth. In that part of the cloth where the figure is developed in blue, the blue warp is brought up on the blue pick, and the two orange picks situated on each side of it or five picks in all ; in that part where orange is required to show ; when a blue pick goes in the orange ends situated on each side of the lifted blue end are lifted at the same time, this tends to cover the blue end and show the orange warp and weft. The picking is as follows :—

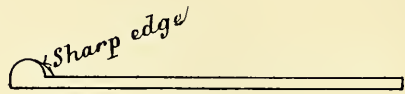
Blue pick coarse weft interweaves in plain order with blue warp, at those points where orange figure must show, lift orange threads on each side of lifted blue thread ; orange pick fine weft interweaves in plain order with orange warp, at parts where blue must show, lift blue ends on this pick, orange pick again, then blue picks repeating.

Fig. 210 is another pattern which it is desired to develop and weave in the colours given, and Fig. 211 gives the same pattern on design paper ; the order of weaving and the bringing up of the different colours of warp and weft is altogether different to Fig. 209. The arrangement is two blue one orange in ends, the counts of yarn of the different colours of warp is about the same ; one blue one orange in picks, the orange weft is about eight times as coarse as the blue.

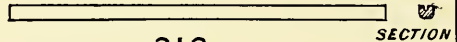
The order in which the picks are inserted is this,



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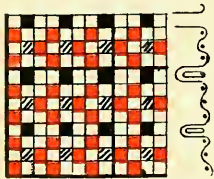


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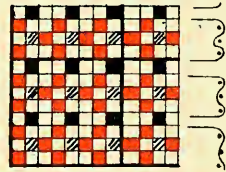


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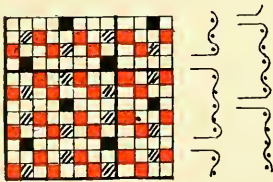
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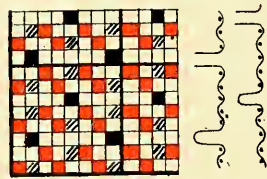
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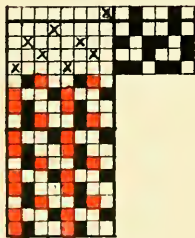
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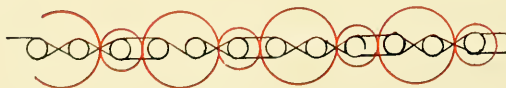
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221

when an orange pick goes in all orange warp is lifted on orange figures, all blue warp lifted on blue figures.

When a blue pick goes in all orange warp is lifted on blue figures, all blue warp lifted on orange figures.

This order of weaving gives a very firm well-knit cloth, the orange warps take up about double the amount of yarn as the blue warp on account of interweaving with the thick orange weft, so that two separate beams will be required.

Different colours of warp and wefts may be used, pale blue and white make effective patterns, and different designs may be made either geometrical or floral.

WARP PILE CLOTH.—Plate 23.

The pile in these cloths is made by the warp threads, and the cutting takes place in the loom either by hand in the hand loom or automatically in the power loom, there are two classes of these cloths, in one the loops of the pile are cut and form plush or cut pile, in the other class the pile is left uncut and forms Terry pile, sometimes a portion of the pile is cut and another portion uncut, and figured effects are produced in this way, the contrast between the cut and uncut pile giving the desired effect ; two warps are used one for the ground or body of the cloth the other for the pile warp.

The loops of the pile are formed by inserting a wire instead of a pick of weft when the pile warp is lifted, these wires Fig. 212 are of different thickness according to the length of pile required, they are also of two kinds, one for the cut pile the other for the loop pile ; in the hand loom the wires for the cut pile are provided with a small groove along the upper edge,

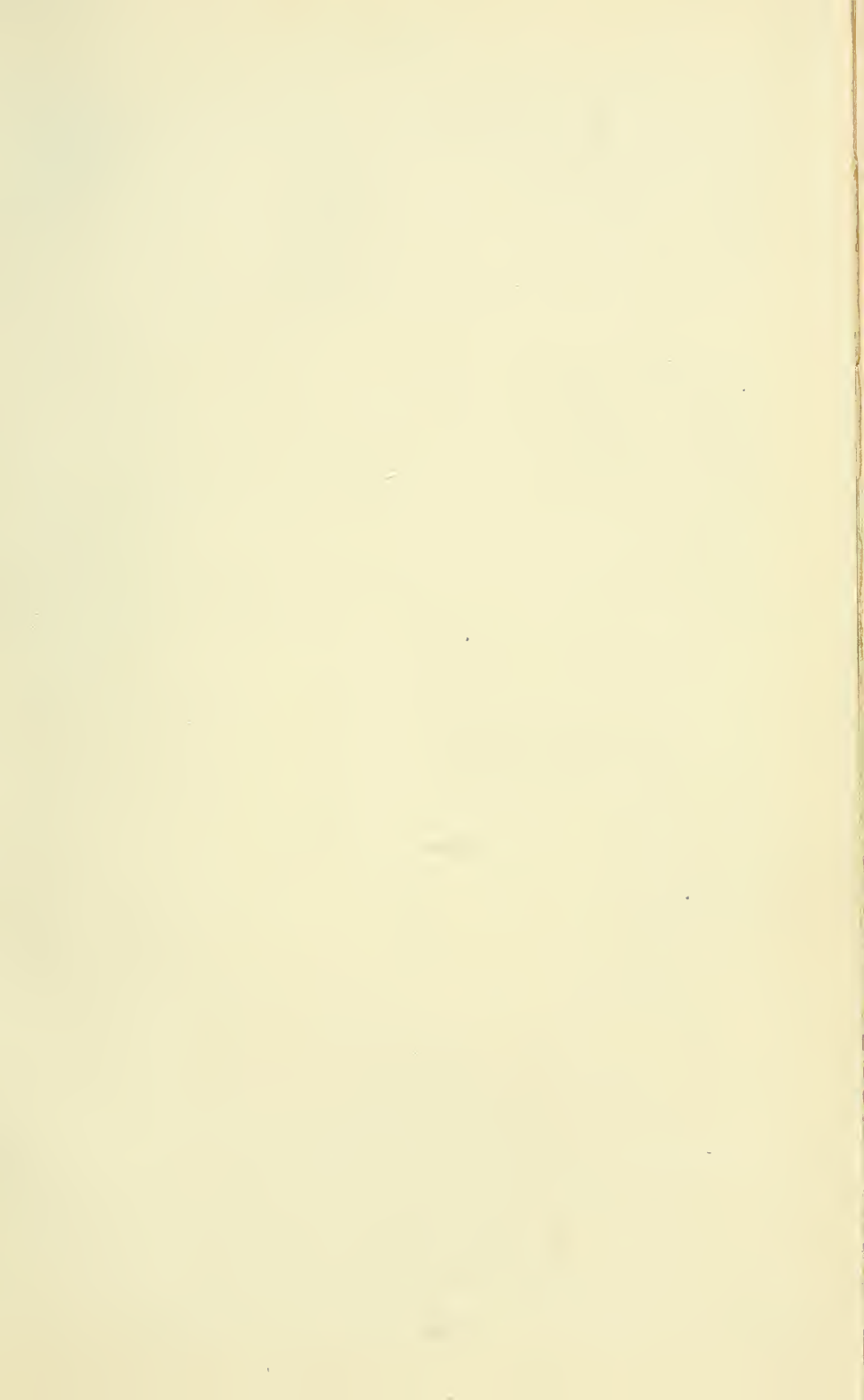
and after the wire has been woven into the cloth for a few picks a small sharp knife Fig. 213 termed a Trevette is run along the groove, cutting the pile and liberating the wire, the wires for the loop or terry pile are not cut out but withdrawn leaving the loops intact.

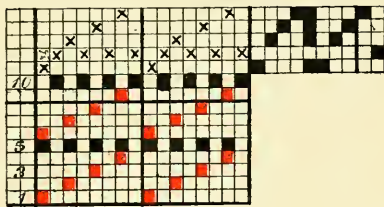
In the power loom the wires for the cut pile are provided with a small knife, Fig. 214, at one end, and as the wire is withdrawn it cuts the pile, the wires for the loop piles are without a knife; about half a dozen wires are using at the same time, the first one inserted is the first to be withdrawn, by this means the pile threads are firmly bound to the cloth before they are cut.

The arrangement of ground threads to pile threads are one, two, three, or four ground to one pile end.

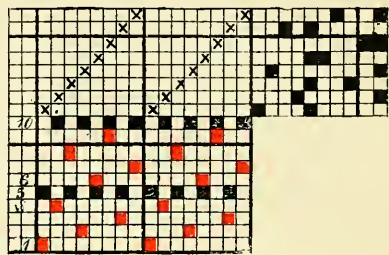
Fig. 215 gives an example, the arrangement is two ground ends one pile end, ground weave plain, red indicates the ground weave, and black pile picks where a wire is inserted instead of a pick of weft, shaded squares pile warp lifted and weft inserted, a section of the cloth is given at the side, the interlacing line representing one pile thread, the dots the picks; opposite to each pile pick it will be seen that loops are made by the insertion of a wire; in Fig. 216 the same pattern is given except that the loops are cut, forming plush; the pile threads are allowed to issue between two picks which are in the same shed, these ground picks are beaten together as closely as the diameter of the pile threads will allow, and hold the pile warp firm, and makes the pile when cut stand erect.

Fig. 217 is arranged two ground, one pile, the same pile threads are not cut on every pile pick, one half of the pile being lifted on one wire pick and one

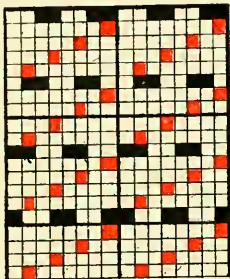




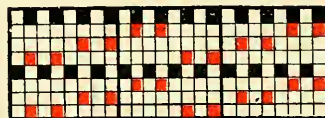
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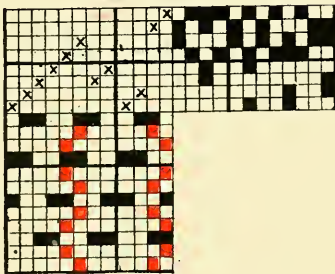
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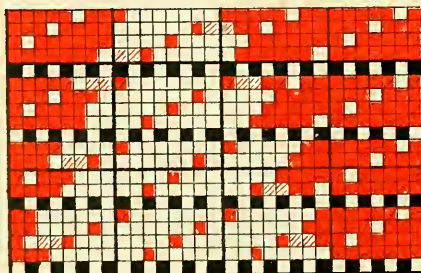
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half on the next wire pick, sections of cloth are given at the side illustrating the cut pile picks to which they are opposite.

Fig. 218 illustrates another example where one half of the pile is cut the other half left uncut, a section of the cloth is also given, on the cut pile pick a wire with a knife is inserted, on the looped pick a wire without a knife.

Another class of Terry pile used for towelling is made without the aid of wires, the pile is distributed more or less equally on both sides of the cloth, two warps are used one for pile lightly weighted, the other for ground. Fig. 219 gives a pattern of the cloth and Fig. 220 a section ; for two picks the reed gives way leaving these picks about half an inch from the fell of the cloth, on the third pick the reed is held firm, beating up the three picks to the fell of the cloth, in doing this the picks slide on the ground warp but the pile warp being slack, it is brought forward in loops on each side of the cloth Fig. 221.

WEFT PILE CLOTHS.—Plate 24.

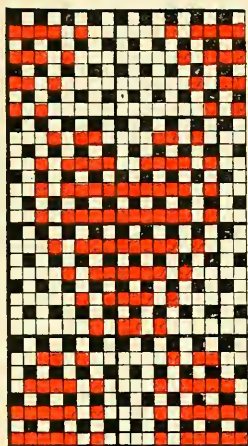
Velvets or Velveteens, Figured Velvets, and Corduroys come under this head, the warp is of strong material generally two-fold, the weft is finer with a large number of picks per inch, say from 200 to 400. The weft floats over three, five, seven or nine threads, and under one, these are termed pile picks, every second, third, fourth or fifth pick, the weft interweaves with the warp in plain or twill order, these are termed ground picks and give a plain or twill back to the cloth; the floats of pile weft are cut in the middle by means of a specially constructed knife, when the brush like surface is obtained characteristic of these cloths ; these knives consist of a long bar of steel with a knife edge

at one end, the cutting end is covered with a sheath of sheet iron for a few inches, and secured to the knife, this sheath passes beneath the floats of weft, and tightens them, they come in contact with the keen edge of the knife and are cut asunder, the sheaths are of different sizes for different lengths of floats, if it be too small it is liable to pass beneath the floats of the wrong picks and cut unequal or long and short pile.

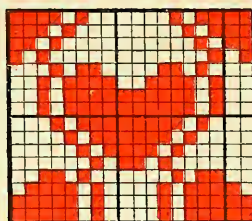
Fig. 222 gives an example arranged four pile picks one ground pick, ground weave plain, black squares indicate ground picks, red pile picks, the binding of the pile picks to the cloth is in twill order taking each alternate end, the order of binding may be satin, but it would make no difference to the pattern on the face of the cloth, because the binding points of one pick is covered up with the floating pile weft of the other picks, the selection of the binding points in any other order than twill is done to secure some advantage in more firmly binding the pile picks to the cloth; below the design is given a section of the cloth the dots indicate threads the interlacing lines the fifth and tenth picks weaving plain the first pick weaving pile, it will be seen that the points where the pile weft interweaves with the warp gives the races for the cutters knife as shown by the arrow. Fig. 223 gives the same pattern with pile weft bound in satin order.

Fig. 224 is another example arranged four pile picks one ground pick, ground weave twill.

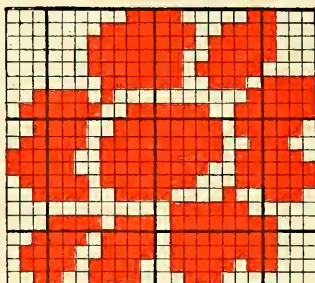
In both Fig. 223 and Fig. 224 the pile picks are held to the cloth by looping under one thread only; in Fig. 224 the weft of the ground pick will tend to cover up the underside of the loops of the pile picks, they will therefore be less liable to fray out on the wrong



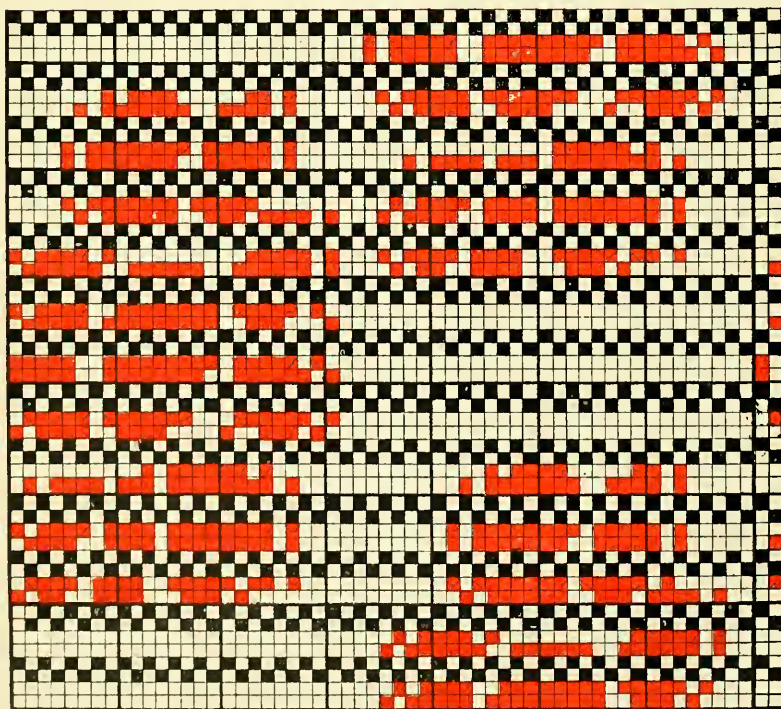
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side. To make the pile perfectly fast, the pile weft must interlace with more than one thread at the binding points; Fig. 225 gives an example, black ground, red pile picks, with a section of the cloth below the design; the pile will not be so full by this method but the cloth will wear much better.

Figured Velvets are made by allowing the pile weft to float on the face where figure is required, passing to the back at other places. In Fig. 226 black indicates ground picks red pile picks, the figure at the edges must go in steps of two, there must be no shorter float than the weft passing over four threads at the edges, this is done to provide proper races for the cutter's knife, and to enable each float to be cut in the centre so that all the pile will be the same length; Fig. 226 is only part of a large figure but sufficient to show how the patterns are placed on design paper.

Corduroys—These cloths give ribs or cords down the piece. Fig. 227 is an uncut sample of cloth, the gut or division which separates each rib is brought about by the bindings of the pile weft to the cloth. The pattern with looming and lifting is given at Fig. 228 the black squares give ground weave twill, red pile picks, the arrangement is two pile one ground pick. The cutter's knife is inserted under the floats of the pile weft cutting them in the centre, and giving the familiar appearance of fustian, the looming and lifting plan is given as usual.

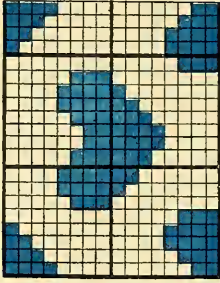
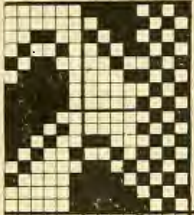
FIGURING WITH EXTRA WEFT.—Plate 25.

In this class of cloth two wefts are required, one for the body of the cloth which interweaves with the warp and forms the pattern for the ground weave, the other which is generally coloured takes no part in the

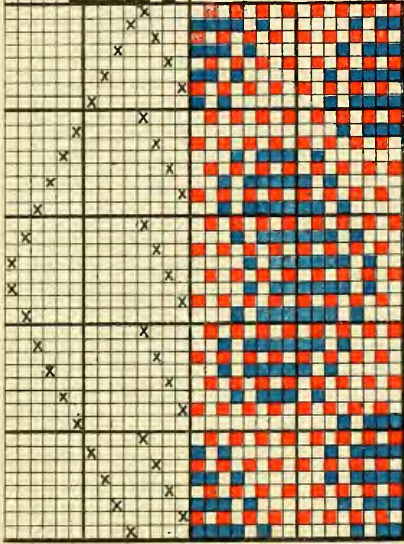
formation of cloth, but is used for figuring and ornamentation only, as two or more separate shuttles must be used according to the number of colours in the pattern, a changing shuttle box is required.

Fig. 229 is a small spot figure required to be brought to the face as an extra weft spot, and to simplify the matter the filled-in squares both red and black in these examples are taken to represent weft instead of warp.

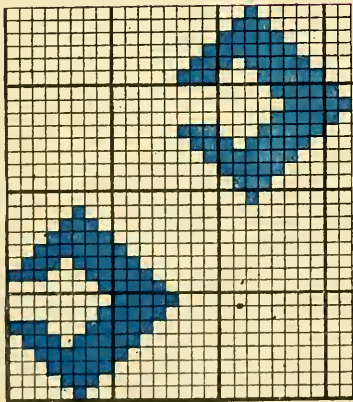
Fig. 230 gives the arrangement of one ground pick plain, one spot pick, the weft floating over at the required places to form the spot, then passing to the back of the cloth, where it floats until required to come to the face again to suit the pattern ; in placing the pattern on design paper put down on each alternate pick the pattern for the ground weave black squares (plain) then on the picks missed place the pattern for the extra weft figure, red squares, before and after forming figure the extra weft interlaces with the warp in plain order, to prevent the extra weft from fraying out, after the loose material is cut away from behind, in small spot figures the same as Fig. 230 it would not be worth while cutting away the floating picks behind ; but in examples where the weft is floating behind for several inches, it is necessary it should be done ; sometimes the weft is brought up at intervals into the face cloth at points where it is not liable to show, and in this way it is bound into the face cloth and the shearing process is not required. In an ordinary circular or drop box loom the shuttle is changed once every two picks, on account of the changing boxes being fixed to one side of the slay only, with a single box at the other ; in Fig. 230 a loom must be used with boxes on each side of the slay so that changes can



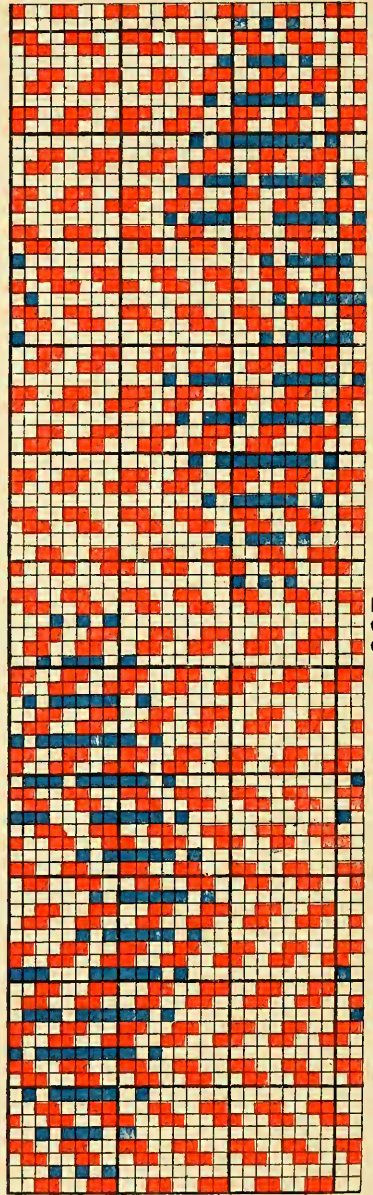
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take place on single picks ; if the pattern is arranged two ground picks two extra weft picks, then the change takes place every two picks and an ordinary box loom can be used, Fig. 231 illustrates a pattern made after this style. Fig. 232 is a small flower to be brought up as an extra weft figure.

Fig. 231 shows Fig. 232 arranged in alternate order, two ground picks, black squares (plain) two extra weft picks.

In pegging the lattice for small patterns as Fig. 229 the pattern need not be arranged on design paper, pick for pick, but each alternate pick pegged straight off for the ground, then go over the lattice again and peg for the extra spot figure on the picks missed the first time over, if the pattern is required to show the right side up in the loom peg the blanks, if the wrong side up peg the filled-in squares ; in card cutting say for Fig. 231 cut as many cards for the ground as may be required plain ; number them, then cut the cards for the figure, which may be placed on design paper, or two flowers in alternate order, without putting in the ground weave, number these cards, then lace them in their proper order with the ground cards so that the numbers run consecutively.

FIGURING WITH EXTRA WARP.

Plates 26, 27, and 28

Two sets of healds are generally used one set for the body of the cloth, and the other set for the extra figuring material, the ground weave may be plain, twill, or any small figuring weave, the extra figuring ends which are generally coloured are brought to the face of the cloth for ornamentation only, at other times they float loosely behind the cloth, and are

afterwards cut away, or they may be bound into the cloth at intervals at points where they will not show through at the face.

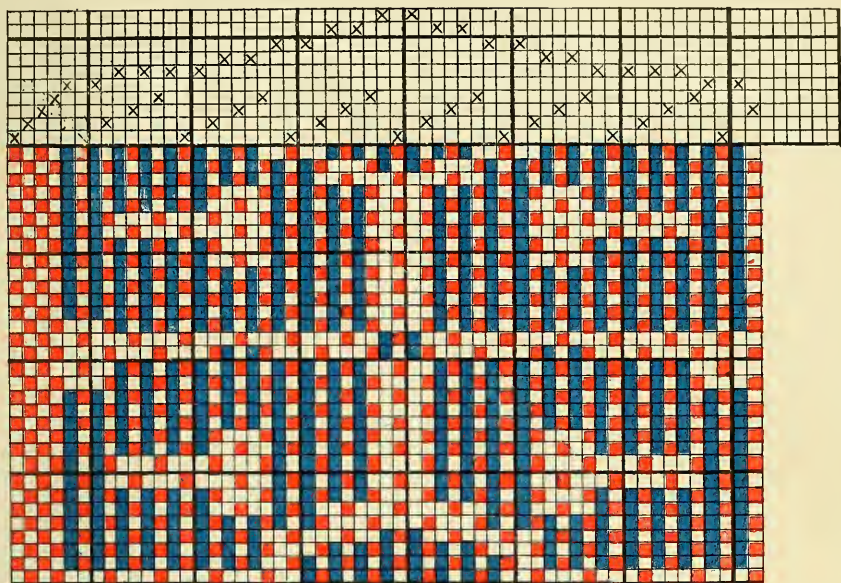
Fig. 233 is a small spot figure arranged in alternate order, and Fig. 234 give the same spot as an extra warp figure on a plain ground ; the arrangement is one figuring end one ground end, ground weave plain, the ground ends are drawn on the front staves (four are used to prevent overcrowding of stitches) the figuring staves behind ; fourteen staves in all ; the lifting plan is also given ; the plain ends are drawn two in one dent, the figuring ends pass through the respective dents in the reed to which they are opposite, and which are already occupied by the ground ends, so that the extra figuring material is cramped in. To prevent the coloured ends from pulling out when the loose material is cut off from behind in the finished cloth, each end is allowed to weave in plain order, just before and after weaving figure.

Fig. 235 gives another spot figure alternate arrangement.

Fig. 236 gives a ground weave a wave across the piece on four staves the ends drawn in point draft.

Fig. 237 gives the pattern Fig. 235 arranged on the ground weave Fig. 236, the arrangement being two ground ends one figuring end, the complete pattern requires twenty staves, eight for each spot the ends in both drawn in point draft, and four for the ground.

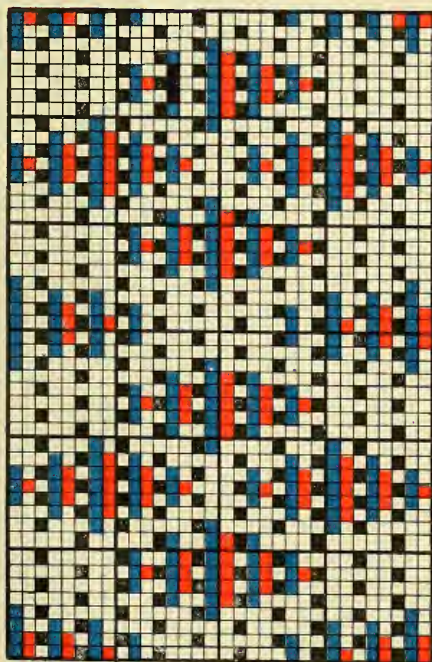
Plate 27. In the making of Dhooty borders extra warp figuring is largely adopted, the body of the cloth being plain the borders are ornamented on each side for varying widths with extra coloured figuring ends. Fig. 238 gives an extra warp figure for a Dhooty border ; when figures are required to show on both sides of the



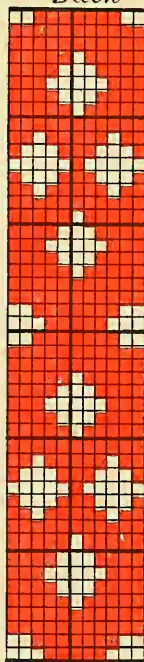
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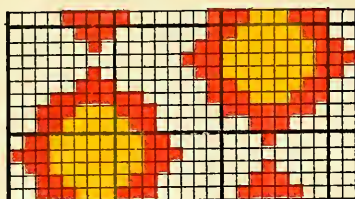
Face

Back

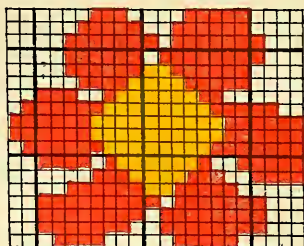


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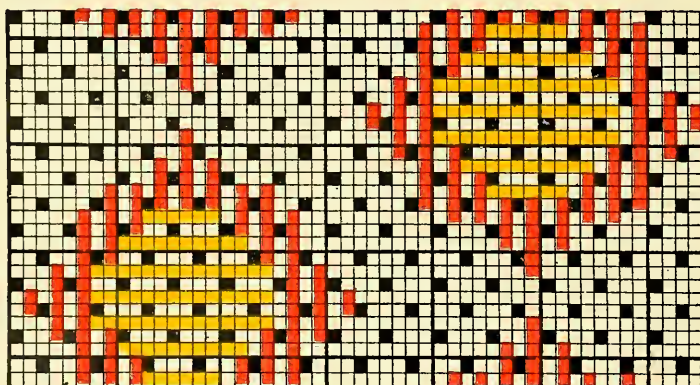




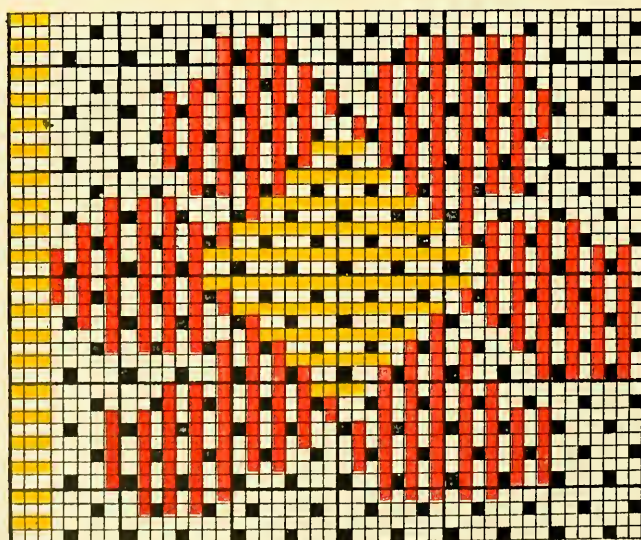
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242



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243

cloth in two different colours Fig. 239 shows the arrangement, the face and back patterns are shown alongside Fig. 239.

Figuring with extra warp and extra weft.—

Plate 28 illustrates the making of patterns using extra warp and extra weft. Fig. 240 is a pattern it is required to reproduce in the cloth using the colours shown, the red being extra warp the yellow extra wefts the ground weave grey (black squares) plain cloth, the arrangement is one end ground one end extra (red) one pick ground one pick extra (yellow); the pattern on design paper Fig. 241 shows each end and pick arranged in its proper place, standing on double the number of ends and picks to Fig. 240, this is on account of showing the ground weave in addition to the figures.

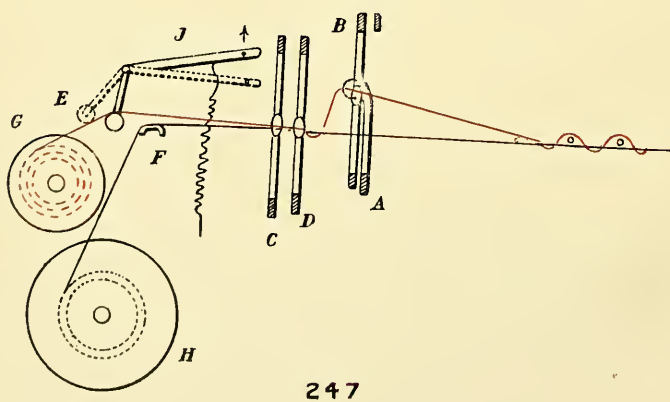
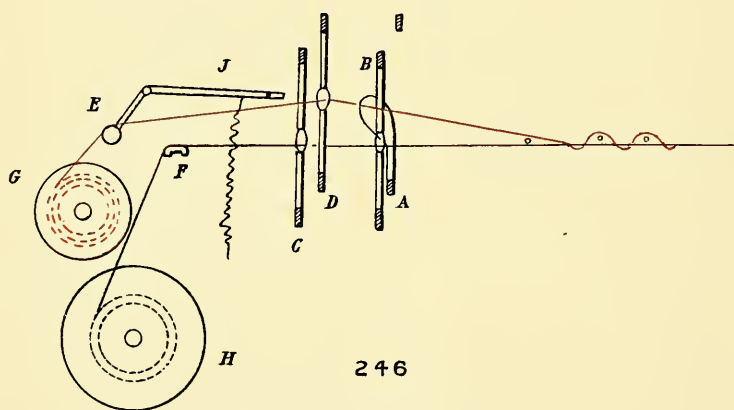
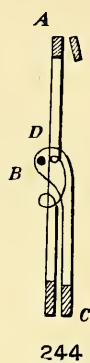
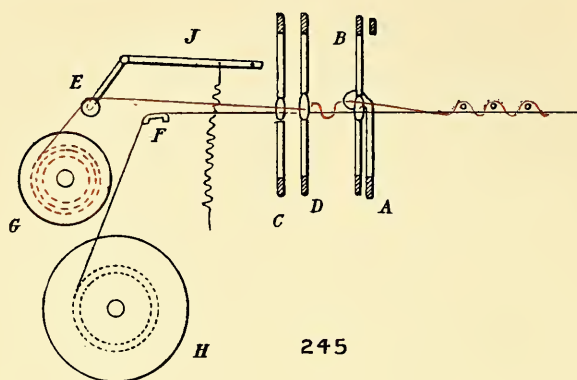
Fig. 242 gives another example, space only allows one figure to be shown; the same is repeated showing the ground weave plain in Fig. 243, the arrangement is one end ground one figuring end one ground pick one extra weft pick yellow, on the first five and the last five yellow picks it appears as though these picks take no part in forming figure, but it must be taken that these are the extra weft picks for the other flower which cannot for want of space be shown; two flowers are assumed to be arranged in alternate order the same as the spots in Fig. 240.

In pegging or cutting cards in these examples, if they are woven the right side up as shown on paper; the whole of the ground ends except where extra weft is floating over must be lifted; and the extra ends if required to be up to form figure must be lifted at the same time. In both Fig. 240 and 241 red equals floating warp ends and yellow floating weft picks.

GAUZE AND LENOS.—Plate 29.

Cloths under this head have more or less of a face like character the threads and picks instead of lying in parallel lines are twisted and pulled out of the straight course, this is on account of some of the threads being under the control of two separate healds, either of which can lift them to the right or the left of one or more other threads, this twisting of the threads and stopping twisting is the means whereby the patterns are produced ; when a crossing takes place for several picks in succession the picks in that part of the cloth run together in groups, whilst at other parts of the cloth these groups may be split up into smaller groups by the action of other crossing ends, and at another point the picks may run single on account of interweaving with the ground warp in plain cloth order for the production of pattern the doubling threads are sometimes made thick and of various colours ; the doubling threads and the crossed threads interweave together in the formation of lace, plain, checks and figured effects ; in the jacquard by this means very elaborate patterns are obtained. Gauze and leno patterns make good firm open fabrics, the crossing of the threads locking the warp and weft together.

In the production of the cloths just enumerated two separate lots of healds are required, one for the ground weave, and crossed ends, the other for the doubling or crossing ends, the healds for the ground ends are of ordinary construction, and the ends to be crossed and otherwise are drawn through them in the ordinary way, those ends which are required to be lifted in two positions, pass beneath the crossed part, and are drawn through the loose slip of the doup heald Fig. 244 illustrates the construction of the doup



it consists on an ordinary heald A with a loose heald passing through the eye then over the top, the free ends being attached to the heald stave C, the doup for thread passes not through the eye, but through the loose slip at the point D. Throughout the descriptions the part B C through which the thread is drawn will be termed the "loose slip," the loose slip and ordinary heald A taken together will be termed the "doup."

The slackner, a bar over which the crossing ends pass, this bar gives way whenever a crossing takes place. The ends crossed "Net ends."

The ends weaving ground in stripes or otherwise, plain twill or any other weave, ground ends.

The doup end will be taken as the crossing end.

Fig. 245, 246, and 247 shows the position of all the parts in the loom for three picks; H is warp beam for ends which never lift, G warp for doup ends, F stationary back rest, E movable back rest, or slackner, A loose slip, A B doup, C heald for stationary end, D heald through which the crossing end is drawn in addition to being drawn through the loose slip of the doup. J the free end of a lever which is pulled down by a spring fixed to the floor, at the other end of J is the slackener bar E over which the doup ends pass.

Fig. 245 shows the drawing in of the ends.

Fig. 246 shows the heald through which the doup thread is drawn lifted bringing up the loose slip to the near side or the left of the stationary end drawn through C.

Fig. 247 show the doup lifted, taking up the thread on the far or right side of the stationary ends it will be seen that when this takes place a crossing takes place in the shed, between the healds B, D, & C, and to prevent the yarn from breaking. the lever J is

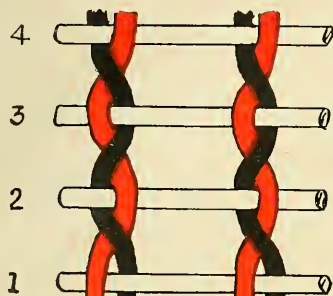
lifted allowing the warp to go slack. The loose slip is connected with a skeleton stave at the top, so that when the loose slip is to be lifted, it is brought up in the ordinary way, this takes all strain off the douping threads.

GAUZE and LENO.—Plate 30.

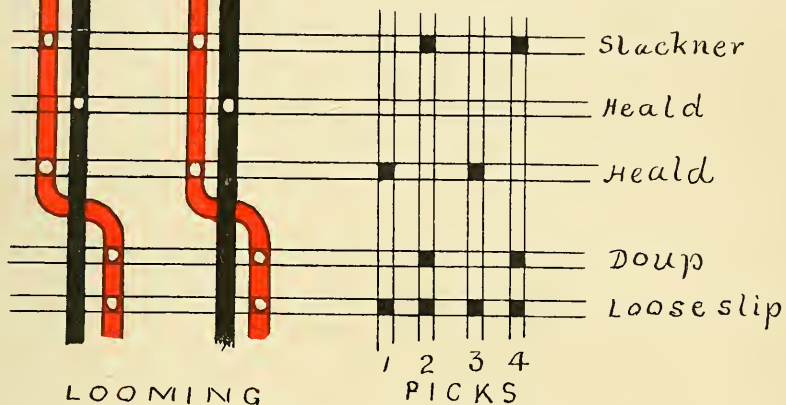
Two methods of working with doup healds are in common use, when the loose slip is at the lower side they are known as “Bottom Doups,” and the cloth is woven with the wrong side at the top; when the loose slip is at the upper or top side they are known as “Top Doups,” the right side of the cloth is on the face, although the former appears to be in general use the latter possess many advantages, chief of which are: the cloth is the right side up when weaving, and any mis-lifting can be easily detected, broken doup healds are easier to repair; bottom doups will be assumed unless otherwise stated.

There are two methods of placing the patterns, along with the looming and lifting plans, on paper; one method is to rule lines to represent picks of weft, other lines at right angles to these represent threads of warp; whenever a thread is lifted on any pick the same is indicated by a dash; the healds are represented by lines below the pattern; the heald upon which any end is drawn is indicated by a dash; the lines which represent the healds are produced to the right, these are ruled at right angles by lines which represent the picks in the lifting plan, a dash indicating which healds are lifted on each pick Fig. 249.

The other method is to use design paper; filled in black squares to represent lifting of ground and crossed ends and coloured squares to indicate the lifting of douping or crossing ends; a solid red square



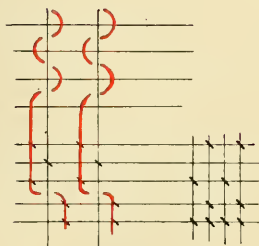
Pattern



LOOMING

LIFTING PLAN

248



249



250

to indicate the lifting of the heald through which the douping thread is drawn, a shaded red square to indicate the lifting of the doup Fig. 250. After the pattern is placed on paper by either system the following rules must be observed in putting down the looming and lifting plan.

The slackner is placed behind all the healds ; as many slackners are required as there are doups.

The crossing end and all the ends crossed are placed in the same dent.

The doups and loose slips are placed in front of the ordinary healds ; the slips first.

The healds which carry most threads are placed nearest the front after the doups.

The healds which carry the crossing ends may be placed before or behind those carrying the crossed ends, the former method is here adopted.

Put down the lifting of each heald separately, omitting the doups, slips, slackners, and healds through which douping threads are drawn.

Put down the lifting of the healds through which the douping threads are drawn and lift their slips at the same time as the heald is lifted.

Put down the lifting of the doups, lifting the slips and slackners belonging to them at the same time.

Fig. 248 illustrates the making of a simple gauze pattern the same weave as the example shown on plate 249 and although two beams are shown in that case one would be sufficient as each thread, the douping, and crossed, will be equally pulled out of the straight line, in Fig. 248 the red end is the douping thread lifted on every pick, the black thread remaining down in each pick, the looming is shown below, the lines across represent staves and slackner, the circles indicate the

ends drawn on the staves, the lines at right angles to the staves represent picks in the lifting plan, the circles indicate which staves are lifted on each pick, on the first pick the heald and slip are lifted corresponding with Fig. 246 on the second pick the doup, slip, and slackner are lifted, corresponding with Fig. 247.

Fig. 249 shows a quicker way of placing the pattern on paper.

Fig. 250 gives the example on design paper showing looming and lifting plan, the red solid squares indicating lifting of heald, and shaded squares the lifting of the doup.

Gauze and Leno. Plates 31, 32 and 33.

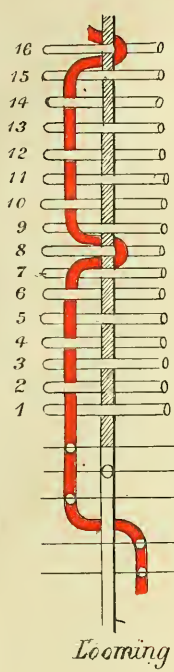
A large number of patterns can be made with one doup, the crossing yarn to come off the same beam as the ground yarn, care being taken, that the two weaves take up an equal amount, the illustrations given on plate 29 can be woven with one beam, because both threads are pulled out of the straight line about the same amount, two beams are shown to illustrate the arrangement when two beams are actually required.

Fig. 251 shows one end crossing one, the red end is the doup end and whenever it is lifted its position is shown, to be over the horizontal lines which represent the weft, whenever a crossed or ground end is lifted the same is indicated above the weft. The pattern on design paper, looming and lifting plan is given at Fig. 252.

Alongside the lifting plan will be found letters which indicate respectively—

S—slackner. H—healds. D—doup. L S—loose slip

Fig. 253 shows one end crossing one, lifted for four picks by the heald, then four picks by the doup,

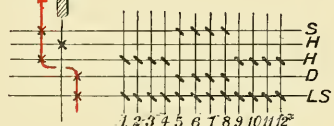


Looming

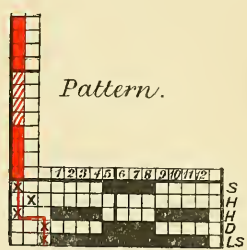


Pattern.

253



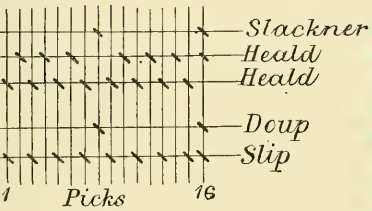
Lifting plan/



Pattern.

Lifting plan/

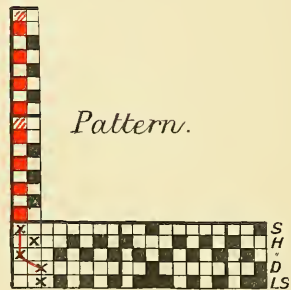
254



*Slackner
Heald
Heald
Doup
Slip*

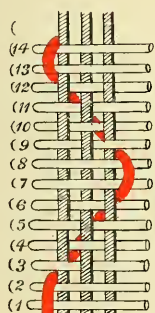
Lifting plan/

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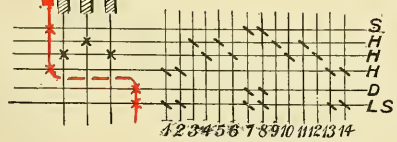


Pattern.

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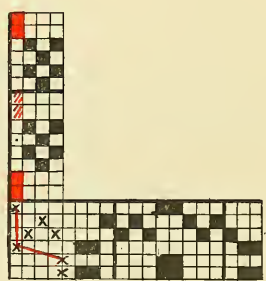


Pattern.

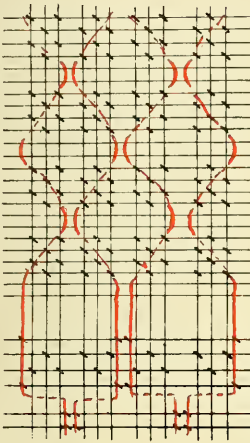


Lifting plan/

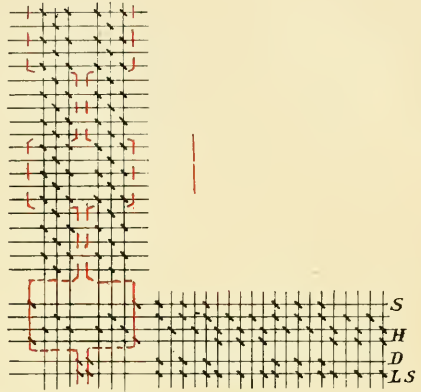
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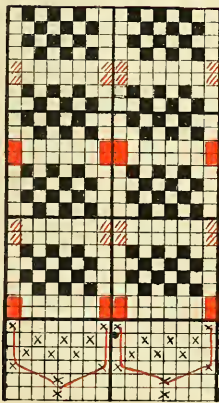
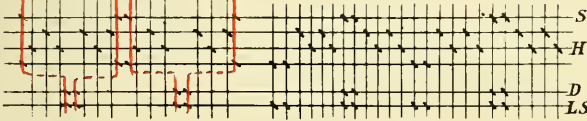
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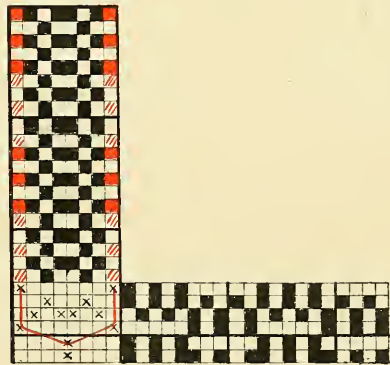
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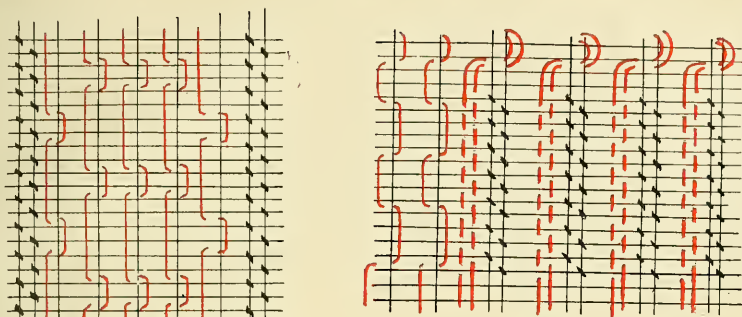
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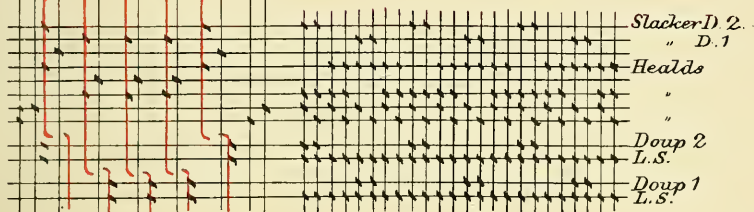
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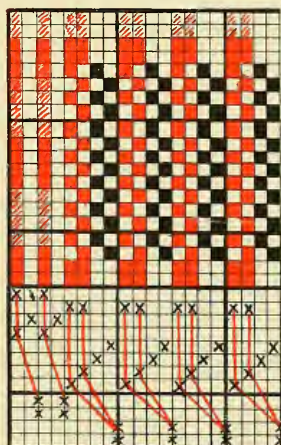
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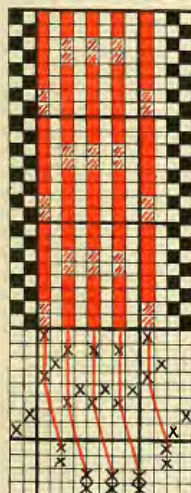
263



261



264



262

Slackner D. 2.
 " D. 1

Doup 2
 Slip
 Doup 1
 Slip



the crossed end never lifting ; Fig. 254 shows the same example on design paper.

Fig. 255 shows one end crossing three, the three ends weaving in nearly plain order ; Fig. 256 gives the pattern on design paper.

Fig. 257 gives an example with one doup which produces a different effect to any yet given, at first sight it might appear as though two douns would be required, but by crossing the douping ends one to the right and the other to the left, it can easily be seen that one doup will do ; referring to the first two douping ends on the first and second picks, the heald lifts and brings up the douping threads apart, on the seventh and eighth picks the doup lifts, bringing up the douping ends as near together as possible, and this is repeated throughout the pattern, the looming and lifting is given with the same figure ; Fig. 258 shows the design, looming and lifting on design paper.

Fig. 259 when extended causes the douping end to form square like figures in the cloth, more especially if the douping end is a thick coloured one ; one doup is required, the pattern on design paper with looming and lifting is given at Fig. 260.

When two or more douns are used a greater number of patterns can be made, and when a jacquard with doup harness is employed the patterns producing scope becomes greater still.

Fig. 261 gives an example with two douns, in the actual cloth the picks of weft are pulled out of the straight line and produces a beautiful effect, the looming and lifting is also given ; Fig. 262 shows the same example on design paper.

Fig. 263 shows a plain check surrounded with gauze when plain is woven the two crossing ends weave

in plain order lifted by the healds, when douping the two ends are lifted by the doup namely on the nineteenth and twentieth picks. Fig. 264 illustrates the pattern with looming and lifting on design paper; two douns are required.

In actual practice it will not be so easy to make the cloths as it may appear on paper, the lifting of every heald and slackner must be timed to suit each other; the slackners must be lifted just sufficiently high to let off the required amount of warp at the time of crossing, the doup and slip must be kept well together, or the loose slip will knuckle up into the warp, breaking yarn, producing bad shedding and rapidly wearing away the loose slips; with bottom douns, the douns must be kept well down a little below the eyes of the ordinary healds, with top douns they must be a little higher than the eyes of the rest of the healds.

GAUZE AND LENO—Plates 34 and 35.

Fig. 265 is a sample cloth.

Fig. 266 gives the pattern for one repeat, the coloured line represents the douping ends, the black lines ground and crossed ends, four staves are used for the plain cloth, the looming and lifting plan are also shown: the portion indicating looming will serve for instructions to the "Drawer in" or "Loomer," the ends are two in one dent in the plain, at other parts where the thick end crosses two they are all placed in the same dent, at the point where two ends cross other two there will be four in a dent, the four ends occupy a space of two dents, therefore three empty dents are missed at the points shown, it is the duty of the loomer after drawing all the ends through the healds and reed, to take out the dents missed, so as to

Dents

4

1

4

1

4

1

1

1 empty

1

1 empty

1

1 empty

1

266

22

$\frac{1}{2}$

Picks

18

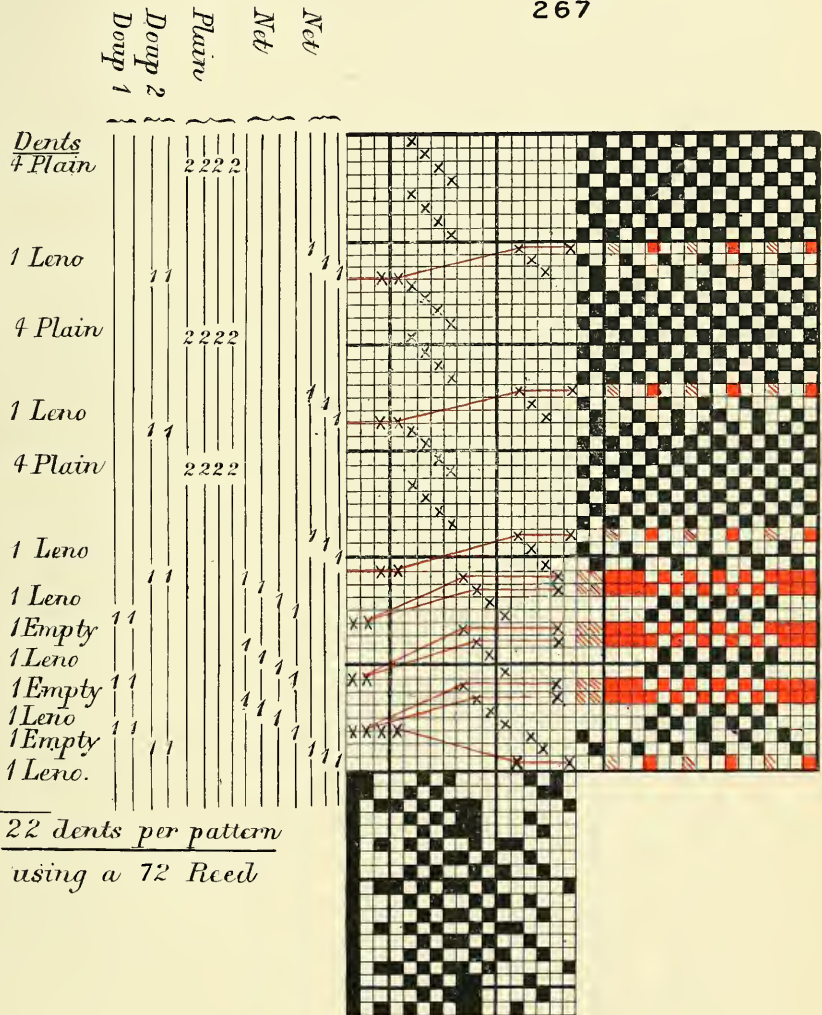
Doubt 2
" 1

Heads

Stack D 2
" 1

265

267



allow the four ends to spread and fill up the space when they are weaving in plain cloth order.

In analyzing the cloth for the pattern the following hints will be found useful.

Using bottom doups, the pattern is taken from the wrong side of the cloth, as in this example.

Put down the lifting for the thick crossing end which is up one with the doup, down two, up one with the heald or six picks in one repeat.

Put down the lifting of the two douping ends crossing two, these repeat on eighteen picks, so far all the douping ends repeat on eighteen picks, the thick end giving three patterns, then it may be safely assumed that the crossed ends, and the ground weave will repeat on eighteen picks, or on some measure of that number; the weave for the stripes is plain repeating on two picks; pull out the thick end without disturbing the ends which it crosses, the weave for these will be found to be one up two down, or six patterns in eighteen picks; put down the weave for the two ends crossed by two, these will be found to be weaving in nearly plain order repeating on eighteen picks.

For a proper understanding of the cloth it will be necessary to be able to give instructions to the heald knitter.

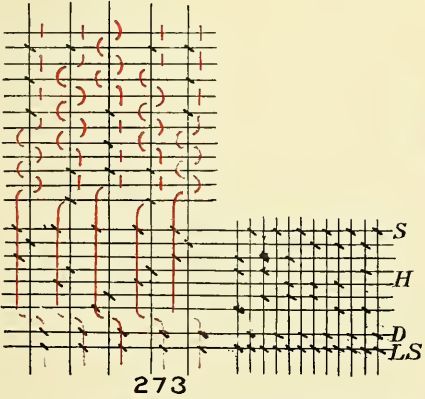
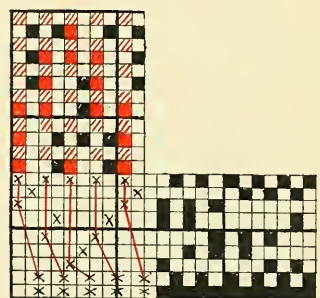
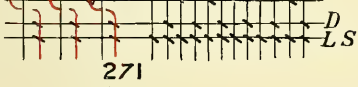
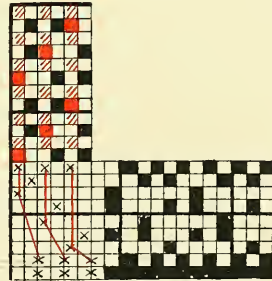
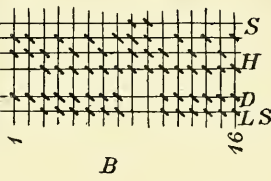
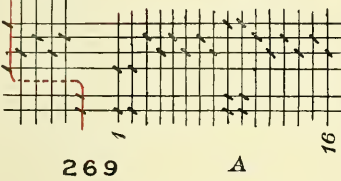
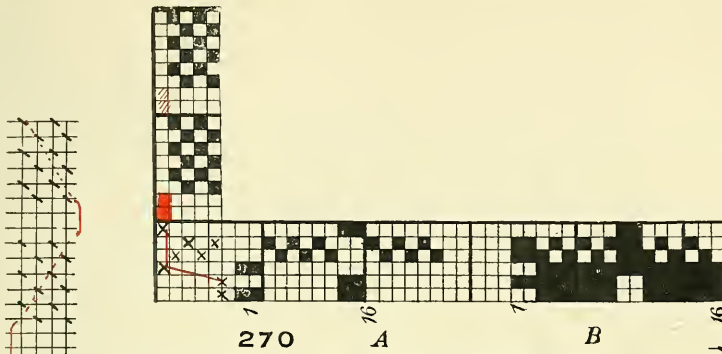
Fig 267 gives the same pattern on design paper, showing looming, lifting, reeding and Knitters instructions. The lines below the looming show the staves, the numbers indicating the number of stitches to be knit on each and the particular part of the stave on which they must be knit. As shown in Figs. 267 there are some empty dents; to be able to find the number missed, first find the reed in which the cloth is made, assuming that the ends are drawn in two in one

dent throughout; a 72 reed is used or 36 dents per inch, the space occupied by one complete pattern is a trifle under five-eighths of an inch; therefore the number of dents for one pattern will equal $36 \div 8 = 4.5 \times 5 = 22.5$ for five-eighths of an inch; as the width of the pattern is a trifle under this 22 dents are taken; the number of dents occupied by the pattern, on account of some of the ends being drawn three and others four in a dent, is only nineteen, therefore the difference between 19 and 22 is three which gives the number of dents to miss in each pattern, as to where these dents are missed it will depend upon the cloth under examination; in the present case it is easy to be seen that where there are four ends in one dent the space occupied is equal to two dents, one dent is therefore missed after each group of four, this accounts for the missed three dents.

Gauze and Leno—Plate 36.

Top Doups. In working with bottom doups it has been in all the examples given assumed that the patterns have been taken from the wrong side of the cloth, and that the cloth when weaving has been the wrong side at the top; in the looming the douping end passed underneath the crossed ends, with the loose slip at the bottom, when top doups are used everything is contrary to this, the loose slip is at the top, and the doup end passes over the top of the crossed ends Fig. 268; the cloth is woven the face side up in the loom. To enable the lifting plan for either top or bottom doups to be easily obtained, no difference will be made in placing the pattern on paper, it will be taken from the wrong side of the cloth in the usual way.

Fig. 269 gives a simple pattern of one doup end crossing four the looming and lifting plan is given for



bottom douns along with it at A ; at B the lifting plan is given for top douns, the douning end being drawn over the crossed ends as shown at Fig. 268 the lifting at B is obtained thus :—

The lifting of every heald, doup, and slip is put down contrary to A ; the slackner is lifted only when the doup goes down, Fig. 270 shows the pattern looming and lifting on design paper, A gives lifting using bottom douns, B lifting using top douns, it will be seen that the blank squares of A correspond with the filled-in squares of B, with the exception of the slackner when they are the same, because whenever the doup goes up or down a crossing in the shed takes place, and the slackner lets the warp slack.

Enlarged patterns with one doup. One doup properly manipulated can be made to produce large patterns, which appear on first inspection as though many douns would be required ; a crossing can take place, either by lifting the heald or the doup, it all depends upon which side of the crossed ends the douning thread has been weaving on the previous pick, also that plain cloth can be woven by allowing the doup and crossed end to weave one up one down on each alternate picks, or by allowing the crossed end and the heald through which the douning thread is drawn weave in plain order, remembering these facts it will be easier to understand the examples given.

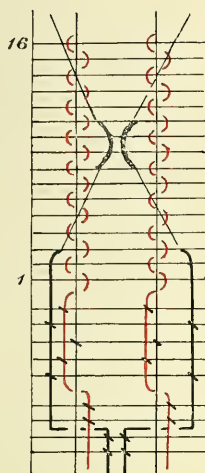
Fig. 271 gives a diagonal line of gauze and plain. and appears at first sight as though three douns would be required to weave it, but as the plain is woven with the douning end in the false positions, and the crossing takes place through the lifting of the heald, one doup only is required, as shown by the looming and lifting plan given, Fig. 272 shows the same example on design paper.

Fig. 273 gives waves of gauze and plain across the piece, using one doup, the looming and lifting plan is shown ; Fig 274 which gives the same example on design paper.

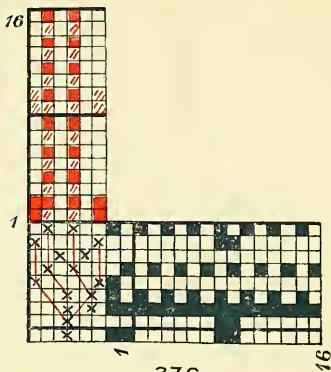
When using one doup for patterns of this description, the doup heald is lifted on every other pick, so that not more than one pick can be inserted between each crossing; the threads work in pairs, one thread crossing one, so that not very elaborate patterns can be produced by this method ; warp spot figures surrounded with plain and gauze can be made by allowing the warp to be lifted by the healds on those picks where the warp is required to float, although the doup goes down on each alternate picks, if the heald is lifted the douping end will be left up on that pick.

GAUZE & LENO—Plate 37.

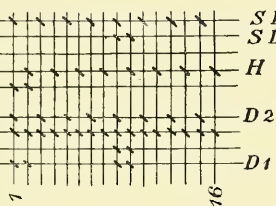
One or more douping threads may be made to cross other threads which are weaving gauze. Fig. 275 gives an example where one thread crosses another thread which never lifts, these two threads are crossed by another douping thread; two douns and two slackners are required, the looming and lifting plan is given; these patterns are more effective if thick coloured yarn is used for the outside crossing end ; owing to extra wear and tear stronger yarn, say two fold of some counts must be used in all the ends ; the pattern with looming and lifting is shown at Fig. 762. **Lappet effects** may be obtained on a limited scale by the use of two douns to work one end, the crossed ends must be good yarn and the douping end, thick, or coloured, or both. Fig. 277 gives an example, where one end is crossing eight which are weaving in plain order throughout, the whole of these threads along with the douping end are



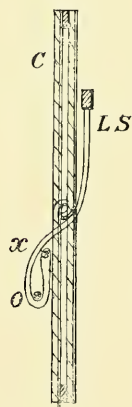
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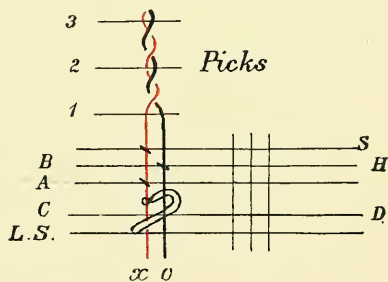
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278

placed in the same dent two or three dents may be taken out to give more room, allowing the threads to spread, and occupy a greater space, the cloth is woven the wrong side up, to the lifting plan given ; when the first doup lifts the douping end is brought up on the extreme right, when the second doup is lifted the end is brought up in the middle of the 8-ends, when the heald lifts the end is brought up on the extreme left only one slackner is required which gives way, whenever the douping end is lifted by either the first or second doup.

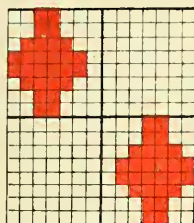
Fig. 278 gives a lappet effect with one doup, one thick coloured end passes over 16-ends which are weaving plain cloth, about six or seven dents are taken out so as to allow the ends to spread.

Catgut. This is the name given by Murphy to distinguish this kind of crossing from ordinary gauze, the douping end receives half a twist more between each pick of weft, than it does in gauze weaving ; Fig. 279 gives an example, the coloured end representing the douping thread ; the loose slip, L.S. passes over X. and O. then underneath O, the end X is then drawn through the free end of the slip ; the open shed is formed for the insertions of pick number one by lifting the thread X by the heald A ; the standard C, the loose slip, and the heald B along with the thread O remaining down, as shown at Fig. 280 ; the crossed shed for the insertion of pick number two is formed by lifting both the threads X and O by the healds A and B ; whilst this is taking place the standard C and loose slip are held tight and taken down, the loose slip pulls thread X underneath, over the top of it and finally brings down the thread X into the lower shed on the left of O ; the slackner is lifted on this pick ; these two

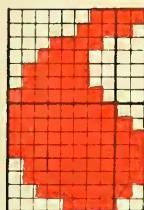
picks give one repeat of the pattern, a third pick is shown it will be seen to be a repeat of the first one. Very strong yarns are required as there is a good deal of friction by this method of crossing; it is not extensively used, and then not generally more than one thread crossing another one, the same as in the example given, the effect obtained is very pleasing, especially when two threads of different colours are used.

LAPPET WEAVING.—Plate 38.

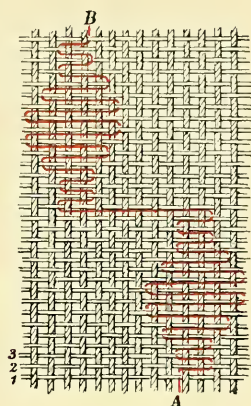
This kind of weaving consists of the ornamentation of a fabric by means of extra warp threads as shown at Fig. 281 where the ground weave is plain cloth, and a thick coloured end is forming figure on the surface, the weft on each pick interweaving with the coloured ends and binding it to the cloth. The mechanism required for the manipulation of the figuring end, consists of a series of needles fixed to a moveable frame, which slides through a distance equal to the breadth of the figure woven, the needles are lifted into the warp in front of the reed, when a shed is formed, carrying the extra figuring ends along with them, the shuttle passes across, the needle frame descends out of the way to allow for beating up with the reed, and the figuring ends are bound into the cloth; the distance through which the needle frame can slide to the right or left on each pick is controlled in a variety of ways; one method is to employ a wheel made up of teeth of different heights, the face of the teeth are of sufficient width that a short lever in the form of a feeler can rest on the face of a tooth, or in the spaces between one tooth and another the feeler is moved in or out according to the varying heights of each tooth, this motion is communicated to the needle frame.



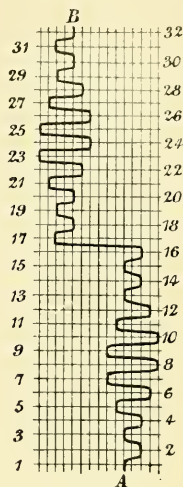
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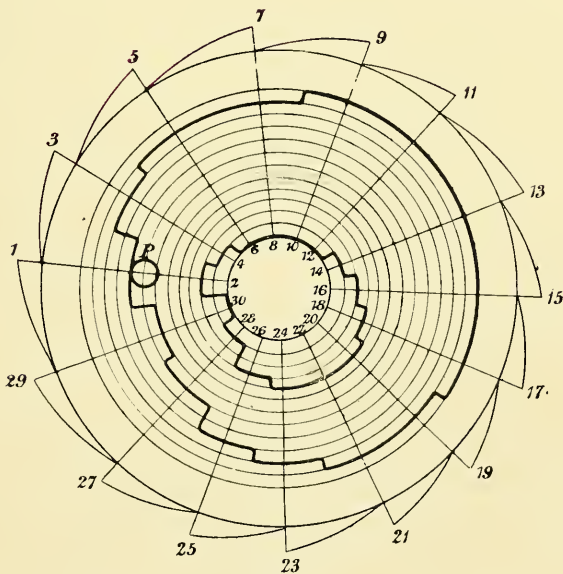
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Fig. 282 shows a pattern on design paper Fig. 281 showing the same pattern in the cloth ; in Fig. 282 the pattern stands on sixteen picks, but each pick on design paper requires two picks in the cloth as will be clearly seen in Fig. 281 ; Fig. 283 shows the drawing of a lappet wheel to suit pattern, the periphery of the wheel is ruled into as many lines 1 to 32 as there are picks in the pattern, or double the number to what there are picks when the pattern is on design paper, these lines are ruled at right angles by other lines, which are distance apart equal to one thread, the thick line shows the varying depth of each tooth ; taking the pattern from Fig. 281 commencing at A in each case and ending at B, the thick line of Fig. 283 will be found to follow the coloured end of Fig. 281, when the first pick of weft goes in the needles are lifted into the shed four threads from the right on the second pick two threads from the right and so on, the different heights and depths of the teeth controlling the movement of the needle frame.

In what is known as the Scotch lappet the distance through which the needle frame can move is regulated by means of a groove cut out of the face of a wood wheel, a pin or feeler attached to the needle frame works in this groove from side to side as the wheel revolves one tooth for two picks, the varying widths of the groove determines the distance through which the frame can move. Fig. 284 shows the construction of a lappet wheel to the pattern Fig. 285 which consists of 15 picks on design paper but will occupy 30 picks in the cloth ; divide the wheel into as many teeth as there are picks in the pattern on design paper—namely, 15, Fig. 284, mark on the face of the wheel as many spaces as there are ends in the pattern plus two for the pin

working in the groove, the distance these spaces are apart equals one thread ; each tooth serves for two picks of weft ; commencing with the pin P on the left side of the groove, the width of the groove at this point is six spaces wide, four for the pattern and two for the pin, after the first pick the pin moves to the right of the groove, the needle frame ascends into the shed, and the second pick is put in, the wheel then turns one tooth, the pin moves to the left of the groove, the width at this point being nine space wide, seven for the pattern and two for the pin, the odd numbers on the outer edge of the wheel, and the even number near the centre of the wheel represent the position that the pin will occupy in the groove when the respective picks are put into the cloth.

During the past few years a good deal of attention has been directed towards lappet motions, and the tendency seems to be to work the needle frame by means of lags and pegs, one contrivance is to have pegs of different heights lifting levers, which in their turn transfer the motion to the needle frame. Another method is to have the pegs all the same height, but to lift levers at different distances from the fulcrum, the distances through which the levers move is conveyed to the needle frame.

The advantages of figuring with extra warp in a lappet loom over extra warp figuring by means of healds is that in the last named method, a good deal of waste material has to be cut away from the back of the cloth ; whilst in lappet weaving there is none of the extra figuring ends floating loosely behind, they form figure during the whole time.

Plate 39.



SWIVEL WEAVING.—Plate 39.

The object of swivel weaving is to produce extra weft figures on the face of the cloth ; when dealing with extra weft figuring using an ordinary shuttle in a box loom, it was clearly shown how the patterns must be placed on design paper, the weft floating at intervals on the face of the cloth forming figure, then passing to the underside and remaining there until required for figuring purposes again, by this method it will be seen that quite as much material must be cut away from the underside of the cloth as there is used. In swivel weaving there is practically no waste, the whole of the extra weft forming pattern ; in addition to the ground shuttle there is attached to the slay cap a number of small shuttles about 4" long $\frac{3}{8}$ " deep, these can be lowered into the shed, moved to and fro by means of a rack and pinion ; when the ordinary shuttle is in use the swivel shuttles are lifted out of the way by means of the jacquard or hand contrivance in hand looms, and tappet arrangement in power looms. After a shed has been made for the ground pick and the same has been inserted, another shed is made for the extra figuring weft, the swivel shuttles are lowered and pass beneath the lifted ends only, if there are two ground picks two swivel picks, another extra weft shed will be made, the shuttles lowered passed beneath the raised ends back to their first position, each shuttle is kept to its own figure, and in each case the same is developed in more than one colour as in Fig. 286 there is two tiers of shuttles one above the other, and each shuttle is used as desired to suit the colours in the pattern.

In designing for these cloths the position of each swivel figure must be noted, Fig. 282 gives about the

actual distances the figures are apart; when closer set figures are made, a different kind of shuttle in the shape of a small horse shoe is used, this carries a small spool of extra weft, the ends under which the extra weft is required to pass are lifted into the open position of the shoe, which then receives a complete turn round carrying the extra weft beneath the raised threads.

The pattern for the ground weave is painted up on design paper, the patterns for the extra weft figure may be painted on the same or a separate sheet in another colour, the two patterns are then each cut separately in the ordinary way; if the arrangement is one ground pick one swivel pick the cards are laced together one ground one extra weft, if there is two ground picks two swivel picks, lace the cards in the same order.

Sometimes the ground weave is of a floral character, the foliage developed in ground warp and weft, the flowers as extra weft figures; the flowers may be painted a different colour to the ground and the design gone over twice in the cutting, once for the ground weft, next for the extra weft picks.

PATTERNS FROM SKETCHES.—Plate 40.

Sometimes the patterns instead of being given in the cloth or on design paper, are given in the form of a sketch the same as shown in Fig. 287, when it is desired to obtain the same effect using eight staves, the pattern on design paper is given in Fig. 288.

Fig. 289 is another example to be made on sixteen staves and thirty-two picks, Fig. 290 gives the pattern on design paper.

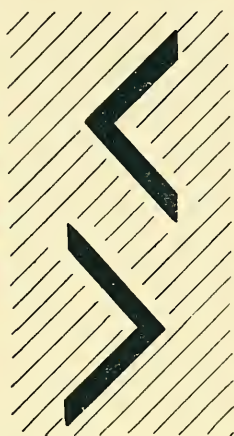
Fig. 291 is a small spot figure to be made on ten staves, the complete pattern stands on eighteen ends



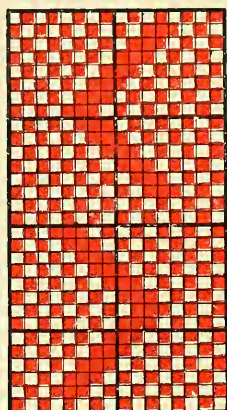
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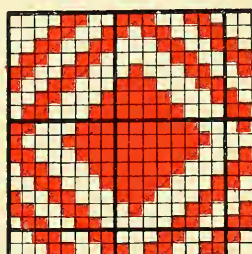
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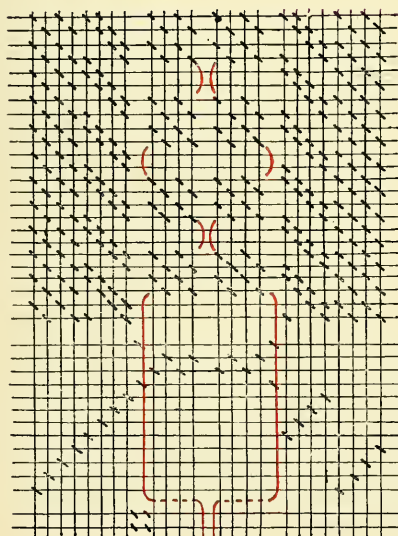
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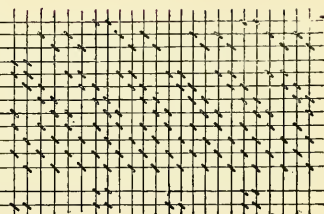
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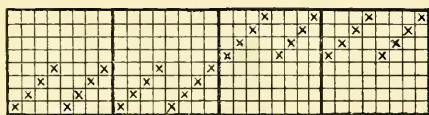


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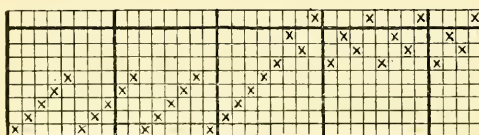


Two ends in a dent,
Knit to a 72 Reed.

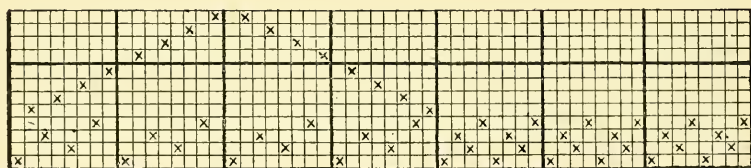
295



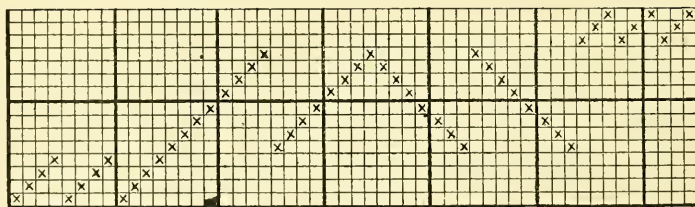
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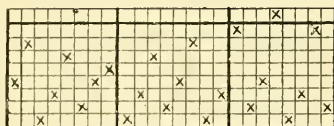
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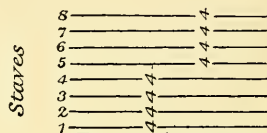
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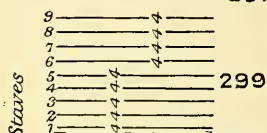
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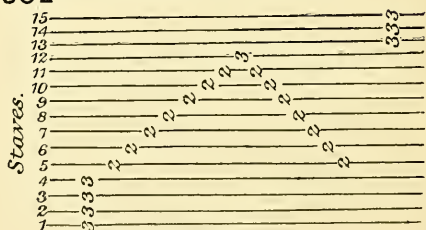
301



Two ends in a dent
Knit to a 64 Reed
297



Four ends in a dent,
for 5 dents. Two ends in
a dent for 8 dents. Knit
to a 78 Reed.



Two ends in one dent.
Knit to 81 Reed.
303

and eighteen picks, the ends are drawn in point draft, the first ten ends of the pattern for eighteen picks gives the lifting plan Fig. 292.

Fig. 293 is a leno pattern requiring one doup to weave it, it is made up of plain, twill and leno effects, the drawn out pattern is given at Fig. 294 showing looming and lifting plan, four healds are used to weave the plain ; the pattern is carried out to twenty-four picks, but it repeats on twelve.

HEALD KNITTERS INSTRUCTIONS.—Plate 41.

When plain, regular twills or sateens are woven, the knitter's instructions are very simple, below is given a copy of an order sheet sent out by a well-known firm of heald knitters, the same is filled in for one set of plain also one set of sateen healds.

Sets.	Shafts.	Ends per inch	Width of Healds in inch.	Healds per Set	Counts of Twist to weave	Top Stave	Bottom Stave.	Inches deep.
	4	60	34	4	32	36	35	11
	5	96	34	5	50		35	11

It is usually quite sufficient to give the counts of yarn the healds are to weave, and from experience the knitter knows, from what kind of yarn the healds must be knit, in case there is any doubt then for weaving about 32s. twist the heald yarn is either 12-fold 40s. or 16-fold 80s.; to weave about 50s. or 60s. twist the heald yarn is either 12-fold 50s. or 16-fold 80s. In Burnley, Nelson, Colne, and Accrington district where cop yarn is used for warp—

12-fold 40s. heald yarn is used for about 32s. twist.

12-fold 50s. heald yarn is used for about 50s. and 60s. twist.

If the looming is a regular one as in point draft Fig. 295 it is generally quite sufficient to give the looming, and the reed to be used with the number of ends in one dent. Using spaced healds Fig. 296 the instructions are given in Fig. 297 the lines representing the staves, the numbers the number and position of the stitches on the respective staves. Fig. 298 gives looming for a plain and satin stripe the satin is drawn 4-ends through one dent the plain two ends in, one dent, knitters instructions are given in Fig. 299.

Fig. 300 is the looming for an extra warp figure on a plain ground, the looming can be easily followed by the knitter in making the healds, the ends are drawn two ends in one dent throughout.

Fig. 301 is the looming for a pique made with 80 face threads per inch, the ends three in one dent throughout, using four healds for the plain ; a set of plain healds suitable for a 80-reed is required ; the face and back ends repeat on every 24 ends, giving 5 repeats of back and 5 repeats of face ends, and as an 80-reed is used 3 ends in a dent, it equals a 40-reed one end in a dent for the back healds, the back 5 healds are therefore knit to the looming given to suit a 40-reed.

Fig. 302 gives a very broken looming on fifteen staves. Fig. 303 shows knitters instructions. -

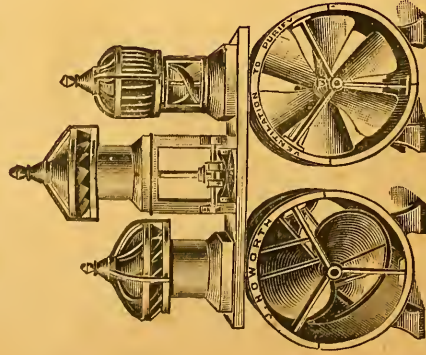


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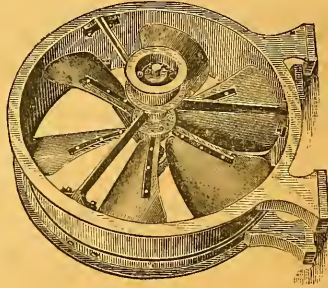


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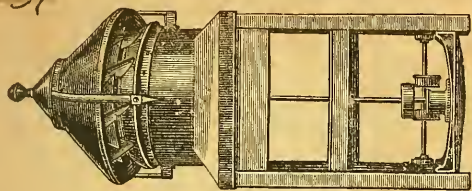
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